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Wm. Hunter
1764.

Lectures
on
Surgery
by

W^m John Hunter.

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Introduction.

In the Course of these Lectures I shall differ very much from what is taught in books on the Subject of Surgery. — The ideas I have to communicate are mostly my own, and not drawn from books. — I have reason to suppose them true because they are founded upon facts. —

I shall consider first the Animal Economy & mention chiefly the actions of the body in a diseased state, with their recoveries & natural functions in Health. — I have if not in view to give a full course of practical Surgery, but merely to teach the Principles of the Art. —

It will be unnecessary to treat of the Operations & of every particular disease; these are taught by Anatomists and others: the principles are not unnecessary and these only shall be the subject of our present enquiry.

Every art has its principles, from which we are enabled to establish old facts, and

4. -
account for new ones: the same holds good in Surgery. -

Effects are what strike the senses most forcibly, even while the cause is unknown, but as these are only consequences we should endeavour to discover the causes, in this attempt we shall often fail. -

We know the causes of Inflammation, Suppuration, & Mortification - hence we are enabled to check their progress. -

We find it necessary sometimes to increase the violence of a disease, before we can effect a cure, as in indolent Inflammation. -

Sometimes it is necessary to change one disease into another: in Venereal Inflammation by exciting, a common Inflammation we cure the disease.

If the Animal was always equal to the task it has to perform, Surgery would be unnecessary, but the powers of restoration which arise out of the Animal being not always sufficient, it is our business to increase the action when too weak, and moderate it when too violent.

It becomes often necessary to use chemical means in the cure of diseases, & these failing we have recourse to mechanical ones, as the different Operations. -

5. A competent knowledge of the parts of the Animal body should ^{be} ~~thoroughly~~ attended to as this will lead us to their uses. We should know their different functions. and consider the dependance one Action has upon another.

As the Operations (tho' the necessity for them is in truth the defect of Surgery) become sometimes indispensable, it is right to know how to perform them.

With regard to operations we should know when they will relieve, and when nothing but an operation will relieve we should know when the Habit will bear an operation - this indeed is sometimes almost impossible to ascertain.

The facility with which a man thinks, gives him a superiority over others. Few indeed have observed nature with more attention than myself yet even now I think myself scarcely equal to the task I have undertaken. - A man will be ignorant of the knowledge he possesses until he arranges his ideas.

The Principles of diseases which are the object of Surgery have not been sufficiently attended to: these we intend chiefly to consider.

We shall begin with Physiology, so far as it is necessary to understand the Principles of Diseases. -

6.
Disease may be called a perversion of the natural actions of the Animal Economy.

I will first consider those diseases that arise from accident: secondly, those that are similar to them: then the union of divided parts by the first intention: next Inflammations which will throw a light on various subjects, as abscesses, the cure of the Hydrocele, indurated Tumours & then the union of parts not cured by the first intention, as Compound Fractures &c.

Lastly we shall treat of some specific diseases as Scrophula, Cancer &c.



Rationale of Surgery.

Matter.

- I. By Matter we mean that substance of which this globe or earth is composed.
- II. - By the impressions of Matter alone we are led to the knowledge of our Senses, and by our

7. - senses only we judge of the existence of Matter. -
III. - But our sensations are not excited by the impressions of matter itself, but by the impressions of the effects of matter, thus when we hear a drum, that our sensations are not excited by the drum, but by the vibrations of the air produced by the strokes on the instrument: so also the properties of matter act upon our senses, as the sensations of sweet and sour, which are not matter, but the properties of matter acting upon the Tongue. -
Touch arises from ~~the~~ resistance in matter.

IV. - Matter is formed in one of the following states: Solidity, Fluidity, Vapour. -

V. - The general kinds and properties of matter are few, but different modifications & combinations of those kinds & properties of matter produce great varieties in appearance. -

VI. - The following properties are common to Matter: - Attraction of Cohesion, Chemical or Elective Attraction, Attraction of Gravitation. - By attraction of Cohesion bodies of similar properties tend to come in contact with one another, and to remain so when thus effected. This attraction is very slight in fluids: in them however the stronger it is, the

more globular the particles appear, *vice versa*... Elective attraction disposes various bodies to join with various other substances forming together one homogeneous mass. Of this we have an instance in the combination of an acid with an alkali. There are as many different elective attractions as there are different methods of mixing matter. Elective attraction operates only when fluidity & vapour are present: the compound may however become solid afterwards by attractions of Cohesion. The increased action of cohesion formed in solid bodies may be called the attraction of solidity.—

VII.—Repulsion is also a property of Matter, but it seems doubtful whether it is so universal a property as that of Attraction. Nevertheless the action of Repulsion seems to be in a great measure the cause of fluidity & Vapour.

VIII.—Magnetism seems to belong to attraction of Gravitation. By the attraction of Gravitation the different parts of matter are kept together so as to form one great whole.—

IX.—Each mass of matter tho' ever so minute has in itself a centre of attraction.—

X.—Heat also seems a generally necessary agent

9.- to fluidity & pour. - Heat seems to destroy all attractions. Mechanics depend upon the external figure & magnitude of bodies; and upon the properties of Gravitation, Attraction &c. -

XI.- The operations arising from changes in matter are regular & determined according to fixed & certain laws. -

XII.- We have been considering and speaking of the properties & modifications of common matter: but considerations on matter may be carried much higher & modifications of or kinds of matter may be found entirely different in every respect from common matter. These are the matter of Animals & Vegetables.

XIII.- The first principles of Vegetable & Animal matter are perhaps the same, but they have many properties totally distinct, and perfectly different one from the other.

XIV.- 'Tis observed (13) that the properties of Vegetable and Animal matter are perfectly distinct altho their first principles may be similar: and indeed so perfectly & entirely distinct are Vegetables & Animals in many properties, and in the modification of matter as observed in their production & formation that no connection between them has ever been traced.

XV.- They differ totally from common matter in

that they have each of them a power of acting and performing various operations within themselves, & of producing or generating matter of their own genus from themselves.

XVI. Vegetables & Animals essentially differ from each other. Both indeed have a power of performing operations within themselves, and of generating from themselves new matter; but in other respects they essentially differ. [The circumstances of worms &c which feed upon earth would seem to afford an exception to this position. It is likely, however, that the earth they take in is only useful so far as it contains Animal & Vegetable matter. In order to determine this we should combine an Alkaline salt with earth, which will destroy any Animal or Vegetable matter it contains, then wash it thoroughly & try if a worm will live upon it.]

XVII. The operations of animals are attended with waste of their component parts; this waste is recruited by a supply from common matter: but common matter cannot be immediately converted into Animal Substance, nor can the decay of Animal Substance be supplied from common matter until it has by certain changes been altered into Animal or Vegetable matter.

11.- Vegetables can immediately convert common matter into their own substance, and be supplied from it, but Animals cannot, which proves the Animal Matter is still further removed from common matter than the Vegetable. - See the Note inclosed in brackets on the opposite side page 10. -

XVIII.- Animal & Vegetable matter may be reviewed in two states, as living or dead - when living it has in itself a power both of continuance & of generating new living Animal Matter, but when dead it loses these powers.

XIX.- Animal & Vegetable matter after death is capable of being acted upon by the operations of Chemistry, & by those of spontaneous dissolution, by which latter it is at length reduced to common matter, out of which it is probably at first formed. The presence of life is an antidote to and resists both the one & the other.

XX.- Animal matter submitted to chemical enquiry, and the operations of fire, yields certain substances peculiar to itself, as volatile Alkali, Empyreumatic oil, Calcareous earth, & a kind of Water. Other substances, as Iron &c are also found, which are superadded, and do not constitute its natural component parts. -

XXI.- Animal matter may receive a supply of its waste from vegetable matter. -

Fermentation in Animals.

XXII. Many changes taking place during life in animal & vegetable bodies have been attributed to a certain operation called Fermentation, for it is known fermentation will alter powerfully all substances which are subject to its action, & even changes them into new and totally different substances. To this the secretions of Animal bodies are supposed to be owing: to this the change of water into the juices of the different plants nourished solely by it has been ascribed to this digestion &c.

XXIII. But the Animal & vegetable bodies are the subjects of Fermentation! No change wrought in them during life can possibly arise from this cause, for the presence of life resists fermentation, and no body whilst retaining its life can be acted upon by fermentation - it is impossible - it can only take place after the destruction of life which is the preserving principle. We here speak of fermentation in the same sense that Chemists understand it.

Principles of Life.

XXIV. The changes arising in the Animal & Vegetable during the presence of life, are produced

13. alone by the peculiar powers of the principles of life. To its operations we refer all the secretions, all the new productions, the digestion of other substances &c.

XXV. The operations of the Principles of life cannot be referred to Mechanical powers.

XXVI. Life is totally distinct from any property of Mechanics. We see indeed the movement & construction of the bones are regulated by mechanical laws, but the Action of the muscles which put the bones in motion are not owing to any mechanical power or principle. Nor by mechanical principles can they possibly be explained.

XXVII. From an examination & survey of Animal matter when dead, we gain an idea of living Animal matter: as from life only we gain an idea of death: so from death only we form an idea of life.

XXVIII. The functions of and changes in an Animal body during life are all to be referred to the operation of the principle of Life. The properties of the principle of life consist in preservation of Animal matter in its living state & in action. Life may exist without matter being in a state of action, and the property of self-preservation may alone be present, life at the same time being present in full force. Thus a new laid egg is truly ^{fully} ~~locally~~ ^{fully} the no kind of

action is known to be possessed by it. [Experiments to elucidate this].— Mr Hunter found that a new laid egg tho' kept by incubation in a heat of 102° until it was hatched in 2 or 3 weeks when the chicken was excluded, shewed not the least signs of putrefaction. Another egg which was not hatched and of course died, became in the same circumstances highly putrid.—

Expt 2^a.— A new laid egg was exposed to a heat between 17° & 15° Farenheit's Thermometer in which situation it was kept half an hour— its life being destroyed by freezing it was thawed by heat: being then again exposed to 25° it froze in half the time it before required (that is 15 minutes).— While alive it had the power of resisting cold & consequently the destruction of its life a considerable time, but when once killed it had no longer the property of resisting the freezing power of the cold. Mr Hunter made a variety of experiments on animals & parts of animals. He attempted to freeze two Carps but without success. He found that for a long time they generated heat, and resisted the destruction of their life by freezing: at length that power was exhausted and they died. This power of resisting death almost every thing possessed of life enjoys.— Mr Hunter found that living

15. vegetables would endure cold & resist being frozen much longer than plants whose vegetable life had been destroyed. Experiments were tried on Dormice &c and all had the same result. —

Expt 3^o. — A dead dog froze in the degree of 33° & a living egg gradually sunk to 29° it then continued stationary for some time; after it rose to 32° & then became frozen. The same Expts were made on snails, snakes, eels and others of the colder & imperfect animals, which proves that the fresh egg is as truly alive as the animals just spoken of, tho' it has only the property of resisting death, and not any kind of Action. —

XXIX. Life does not consist in any modification of matter. Neither is something superadded to matter, or else it consists in a peculiar arrangement of certain fine particles of matter which being thus disposed acquire the properties of Life. — [Sanguis of Mr Hunter if this did not make for the exploded doctrine of Equivocal Generation. He told me perhaps it did, and that as to Equivocal Generation, all we could have, were negative proofs of its not taking place. He did not deny that Equivocal Generation happened. There were neither positive proofs for or against its taking place. —

XXX. — Life has been compared to the Spring

16.
of a watch: as that spring gives motion to all the wheels, so life gives action to the several parts of the body, but this idea is not just: no one part of the body is dependant for action on any other part but the several parts each possess life & action in themselves.

XXXI. Life in a living animal is as much the property of every individual part, as gravity is of every particle of matter. Every one part is as much alive as the whole.

XXXII. Every action in the animal body is produced by the living principle; the secondary actions of parts are as truly produced by it as the primary.

XXXIII. Magnetism will somewhat elucidate what is said of life being superadded to matter, or arising from a particular arrangement of certain particles of matter. A bar of iron placed for a long time in an upright position acquires a magnetic virtue. So perhaps the particles of matter arranged & long continued in a certain position, at length acquire the power of life. The doctrine of colours will tend to the same purpose, for we see by different arrangements the same colours will produce very different shades.

17.- XXXIV. Two, three, four, or any number of particles of matter thus animated may form a muscular fibre - a certain number of these fibres collected together form a muscle.

XXXV.- Life does not consist in any organization of matter, for matter will remain as organized as ever after the destruction of its life. Though organization is not necessary to life yet it is to action. -

XXXVI.- As from an observation of matter in its inanimate state we gain an idea of living matter. So from an observation of the functions and actions of parts in a state of disease, we gain a knowledge of, or correct our opinions of the natural actions & functions of parts in a state of health.

XXXVII. Solidity in matter is necessary for its action, it is the fixed point from which its actions must proceed, and on which they must depend, therefore we find the parts of matter destined for action, solid - these animal solids are kept together by cohesion.

XXXVIII. The muscular parts of an animal are active, of an animal scarcely any part is purely passive: almost all parts have somewhat of muscle in them, and have some kind of, or degree of action. -

Actions of Animals.

XXXIX.. The actions of an animal are twofold - the primary actions are those which every part has in itself, (as to nutrition, growth, support) without regard to any operation, for the benefit of or for producing any change in the system in general. and secondary actions are those which are performed by any part with a view to the benefit of or the producing some change in the general system: as the action of the stomach, the brain &c. The first are the true animal movements, the second are what are called operations of the animal economy; as most secondary actions are employed for the ends of the first, having necessary relation to the first; so those secondary actions are in general permanent & constant. In diseased all these secondary actions may be suspended for a season. The primary ones are never interrupted for the least portion of time so long as the parts live.

XL. There are besides the muscular parts (38) which are the active powers, other parts also which have a kind of secondary motion (that is, a motion communicated to them) the elastic parts, but to the

19. - operations of these, life is not necessary. Their powers are equal after ^{the} death of the animal, to what they were during life.

XLJ. There are also other parts, in the animal body that have in themselves no kind of action but whose use is merely passive which are different in strength & density; some for union, as the cellular substance; others for strength as the Tendons & Ligaments. -

XLJII. It is said (40) that it is not necessary to parts being possessed of Elasticity that life should be present. Elasticity is indeed a property of many species of matter besides animals.

XLJIII. The actions of the living body are simple and compound. The powers of action distinguish living animal and vegetable from dead and common matter. -

Stomach.

XLJIV. - The operations of an animal (41) are attended with a waste of its substance, supply is therefore necessary to their continuance; this supply is performed by means of a bag, which the small in comparison to the bulk of other parts of some animals is the most important of all. - this is the Stomach. - The

Stomach is the principal distinction between animals & Vegetables. All animals have a stomach, no vegetable is possessed of any thing like one. To many animals the heart, brain & nervous system, and many of the viscera are wanting; but no animal is without a stomach, it is the stomach only which is necessary for the support of a simple Animal, and organs of generation for the propagation of its species. Therefore some animals consist of little more than a stomach and genitals. —

XLV. This stomach may be called the true & primary animal; all other parts may be considered as superadded, according to the functions of the Animal to which some or more are given, is to perform on the stage of life. For one animal that possesses a heart there are millions that want it. —

XLVI. The stomach by means of its hidden power, converts various substances into one kind of matter, which is taken into & forms part of the animal. This very curious kind of operation is called Digestion. —

XLVII. This viscus in the most complicated animal, as in man, is intimately connected with the general economy. It is as much

21 the seat of irritability as the brain is of sensibility. It is highly affected by many external influences which in themselves have nothing to do with the operation of digestion, as worms &c. It is more affected by morbid operations produced in Tendons, ligaments & other parts of small natural sensibility than by the same taking place in the muscles. It is chiefly affected by changes produced in the internal parts, as the brain is by those in the external parts. It is intimately connected with affections of the mind, whether produced from injuries of the brain or from horrid stories or sights, to which something or puking has been known to succeed - especially the last. —

Vascular System. —

XLIX. In compound animals, as man, the vascular system, or that by which fluids are carried to & taken from different parts of the body (by which means growth & nutrition is afforded to parts and to the whole) becomes an important subject of enquiry. This is divided into

The Arterious.

The Venous.

And the absorbent systems. —

I. The animal body is considered as an hydraulic machine, by these two acts of vessels its course of fluid is conducted. Experiments have excluded the veins from the theory of absorbing, even in the erection of the Penis, the Veins do not absorb. I consider the Corpora Cavemosa, as veins thro' which the blood is constantly flowing from the arteries. And there are a number of the veins opening into the Corpora Cavemosa and that the blood is flowing into them. That in erection there is a spasm upon the veins, which prevents the blood flowing thro' them - hence an accumulation and distention in the Penis, which ceases with the spasm. I found that by tying the veins of a dogs penis an erection was produced. -

II. Arteries. - The arteries carry the blood from the heart to every other part of the body, consequently they convey the material for the growth, nourishment & support of parts, for the regeneration of them when lost, & the supply of them when wasted: also for the different secretory organs to separate liquors for any further purposes in the animal economy, or to eliminate any thing superfluous or noxious. -

III. Veins. The veins return to the heart the blood which remained of what the arteries

23. had carried from it after the different purposes (51) have been effected. They are also said to carry blood from certain parts to the liver for the production of bile.

III.] Absorbents. The absorbents take up fluids and also solids from different parts of the body, which they pour by means of a peculiar duct into the blood. By this property they become the means of supplying the system of circulation with nutritive particles; also of conveying disease into the habit - thus being the instruments of Health and destruction. By this property of absorbing solids as well as fluids they become the modellers of the shape, form & structure of different parts. They prevent parts from growing into irregular & inconvenient figures. In this light they may be considered as the builders of the Animal fabric, whilst the arteries are the Labourers bringing & laying before them the materials for the work, or as the polishers of the rougher workmanship of the arterial system. By this property they take up & remove parts, which tho' useful in one point of life become useless in another as the Thyroid Gland, the gubernaculum, membrana pupillaris &c. - When a limb is removed, we know the end of the bone sawed thro' is a circular plane with hard edges. If examined at some length of time after the operation, we

find the end of the stump approaching the section of a sphere.

By this property, also when their actions are much excited they take up solid parts whether soft or hard thus producing what has been called ulceration. This may be called ulcerative absorption. They also diminish the bulk or density of parts without ulceration: to this species of absorption no particular name has been given but it may be called ulcerative absorption. In the formation of bone ossification begins on a spot & gradually increases. While the arteries are depositing ossific matter on the outside of a bone the absorbents are moving the lower parts otherwise the bone would become clumsy & unfit for its uses. By feeding an animal with madder we learn that the bony matter is continually depositing on the outside.

LIV. The action of this system of vessels (53) being considered with regard to the ultimate effects may be divided into two kinds: VII.

- 1st Absorption of Extraneous bodies
- 2^d Absorption of the animal itself.

LV. The absorption of extraneous bodies as observed (53) introduces both the particles of nourishment into the system and the particles of disease.

Final use of Absorption.

LV]. The absorption of the animal itself is employed either for the nutrition of the animal, when either absorption of extraneous nutrition cannot take place, or when the mind is unmindful of directing nutriment to be taken in, and yet nourishment is yet necessary to the life of the animal; or when an useless & inconvenient part is to be removed. —

LVI]. The mind is ~~un~~ frequently unmindful of taking in food in fevers, no desire of it being by her perceived: but nourishment being necessary for the sustenance of the animal the fat & other substances are taken up by the absorbents, and carried into the circulation for the necessary purpose of affording nutriment to the different parts of the system: — thus the animal is enabled for some time to feed on itself. —

LVII]. Every part of the body may be subjected by disease to the second kind of absorption (53..... 56). — Absorption will either take up from parts portions of their interstitial substance, as earth from bone &c. or it will take whole parts as an entire bone. —

LIX. When a stimulus of any kind is about to excite the process of absorption, two circumstances will take place — a consciousness on the part of readiness to be absorbed, and a consciousness in the lymphatics

26. of the property, or necessity, to begin absorption: but when the part to be absorbed is dead, the state of consciousness is incompatible with an inanimate state of matter.

LX. - To the removal of dead parts by internal processes this system of absorbents seems alone to be equal; as chemical process can perform it.

Ulcerative Absorption.

LXI. The process of Ulceration or ulcerative absorption is always the same; different causes may indeed produce it, and different circumstances may be present with it.

LXII. The state of consciousness (59) may be induced by different kinds of stimuli but the mode of impression will always be the same.

LXIII. The absorbents have a power of taking up both solids & fluids.

LXIV. The mode of their action is not clearly ascertained: it has been imagined that they are capillary tubes: but capillary tubes can only absorb fluids & the absorbents take up solids.

LXV. - The opinion of their absorbing matter in a fluid state alone (would show, that the solids to be absorbed must undergo solution by means of some fluid which acts upon them as a solvent) is to be doubted of.

27.

LXVI. It is equally, I suppose probable that the absorbents have like certain animals mouth & teeth, that the form of the mouths & teeth in different absorbents essentially differ according to the parts they are to act upon, so that perhaps if we obtain an accurate survey of them we might be enabled to class them according to these differences.

LXVII. It is doubtful whether substances when mixed with the blood are essentially altered or not. The indefatigable parts of vegetables, as the colouring parts of the bark pass off by urine or by some other excretion in their unchanged state. The variolous matter is not altered by the blood. The venereal matter is certainly much altered when taken into the habit, being very different from what it was before it was absorbed. This is the only matter that we know undergoes a change.

LXVIII. The power of living animal matter to consume itself is equally probable with the property of living matter to produce fresh living matter from itself.

Brain & Nerves.

LXIX. From a peculiar arrangement of the particles of Animal matter, muscles are produced. A different arrangement of those particles forms other organs. So from a particular disposition of these particles in perfect animals, the brain & nerves are produced, which being acted upon by various impressions, various sensations arise, the effects of which are the mind & will.

The existence of the brain & nervous system is not necessary to simple life; millions of Animals want both; but they are necessary to the performance of certain functions of life; and without them in those classes of Animals to which they are given, active life cannot go on. Of the perfect Animals, as man, there have been instances of monsters born without a head, but not being able to support the functions of life necessary to be performed from the time of birth, they died soon after they came into the world, but they were truly & virtually alive while in utero.

LXX. The impressions given by external objects are considered as of five kinds. Of these one is touch or feel, of which every sensible part of the body is the seat. The other 4 kinds severally affect peculiar organs adapted to them.

Ideas.

LXXI. The sensation raised by an impression is twofold - 1st its effects on the part to which it is applied; 2^{dly} the change produced in the brain in consequence of that effect. The first is simply passive: the second state is active, for then motion is produced in the brain, and an Idea is formed.

LXXII. According to the kind of change effected in the brain the idea will be agreeable or disagreeable.

LXXIII. As from habit we gain a power of judging and distinguishing what is advantageous or useful, from what is inconvenient & pernicious. when an idea respecting an external object is executed in the mind, & that idea if followed by an inclination to possess or obtain that object, we should be irresistibly inclined to gratify that inclination when arising, and not our power of judging of all consequences that might arise from gratifying the inclination in question (acquired as aforesaid,

from habit, as from repeated observation) determine us to the contrary, this weighing an inclination in the mind we call - Reason.

Will.

LXXIV. - A determination of the mind whether produced by inclination or reason (73) is called the will.

Voluntary Actions.

LXXV. In consequence of any changes produced in the brain, as Concomitant on the action of the will, an action in any moving part of the body is excited. This is voluntary motion or action. Thus different parts of the body, receiving impressions, have a power of acting on, or exciting a change in the brain, and a change in the brain however ~~excited~~ produced, has a power of producing a change in other parts of the body.

LXXVI. The vital principle or the principle of simple life, and that principle on which the powers of sensation depend by this connection (75) act naturally on each other.

LXXVII. It seems as tho' we had no simple sensations, but that every sensation of which the mind is sensible is compounded of two states. (as 76)

31. LXXVIII. The operations of the brain and nervous system (64) are not so extensive as some have imagined. They can neither supply a part with nourishment, nor preserve a part from dissolution.

LXXIX. Every living body has an intelligence of its own feelings, after an impression has been given to it, previous to, and exclusive of any idea existing in the brain. Thus every living part has in itself a consciousness of any impression given to it, whether of pleasure, or of pain, and as it were a power of determining to action, independent of the powers of the mind.

LXXX. The power of the nerves is purely passive - hence previous to any action being excited in them an impression must previously be given to them.

LXXXI. The different sensitive organs are appointed to receive the several kinds of impression given to the body, and which impressions are of five kinds, yet every nerve is subject to receive the impression of touch & pressure.

LXXXII. The living principle is coeval in all living animal matter, with the animal matter itself, and may long exist without sensation - thus a child in utero has no sensation till it is born.

LXXXIII. The nerves are not indebted to the brain

32. for their existence. There may be senses tho' there is no brain, but the existence of the brain is necessary for the formation of Ideas.

~~These~~ ^{Many} Fishes have abundance of nerves with a small quantity of brain. Fatfishes to whom the brain has been wanting & Aciphalus monsters have still their nerves.

LXXXIV. Parts intended for strong sensations have always a great quantity of nerves distributed to them.

LXXXV. This principle of sensation regulates all our external actions, as the principle of life does our internal ones. In man and the perfect animals, sensation is intimately connected with life. If the powers of sensation are constantly kept exercised, the sensitive principle becomes fatigued & the principle of life also suffers with it. Sleep, therefore, by giving relief to the sensitive principle prevents violence being done to the principles of Life.

LXXXVI. When an impression is given it must continue a certain time in order to produce a sensation: if it lasts but a short space of time, no sensation will be produced: if an impression continues too long, a distant sensation will

33. - he yielded, it will then produce only a disturbed state of the nerves. -

LXXXVII. Sleep is ^{the} sensitive principle, whilst rest or inaction is to the living principle. As the living principle may exist, tho' no action is going on, so the existence of the sensitive is not incompatible with the absence of sensations. -

LXXXVIII. Thinking is the effect of particular changes in the mind, accompanying changes in the brain, tho' with respect to ourselves, or a consciousness of a state of action, or sensation we are in a state of non-existence, and altho' we have then no sensations, yet the effects of sensations are not lost, the mind will be thinking (which is the effect of ~~the sensation~~ ^{sensation}) whilst we are asleep as in dreams. We seem then indeed to have sensations, but our seeming perceptions are fallacious. -

LXXXIX. We often dream when awake, having a seeming perception of things & objects which do not exist. -

XC. - Sensation excited in a certain degree is agreeable, in a greater degree painful & then the natural sensations will not take place, but the sensations of pain will be produced. Thus an excessive glaring light applied to the Retina, pain, not vision, will be produced. A loud noise produces the same effect upon the ear. In lieu of distinguishing sounds.

34 the idea of pain will be excited. Even the tympanum of the ear has been broken by this violence.

XC1. An impression different from that which is the one for the perception of which any organ is naturally & particularly adapted, may produce in the given organ the same sensation as would have taken place had the natural impression been given. Thus a smart blow on the eye will excite the same sensation as a flash of light. The same blow on the ear will produce a sensation of sound.

XCII. Uneasy sensations may in many respects be similar to a natural appetite. They rather warn the animal to the avoiding some what injurious to him; or the removing something unsalutary.

XCIII. During sleep whatever actions are removed from the brain (whether consequent on disease or heat) cease. So St vitus Dance does not affect the patient while he slumbers.

XCIV. The living principle in any part of the body will continue after the nerve leading to any part is divided. Sensation is not necessary to simple life. - a child in utero has no sensation yet it lives.

XCV. When a part intended for motion loses its power of motion it wastes, for being now no longer useful to the animal, as a moving part, it becomes

35. open to interstitial absorption (67) the will can no longer influence it. A muscle when its action is suspended by the communication with the brain being interrupted, or by any other means it wastes. — It is a law in the Animal Economy that the size of a muscle will be in proportion to the frequency of its use. Of this we have a variety of instances in the legs of chairmen, the arms of watermen, and the thickneſs of the muscular coat of the bladder when it has been long used to frequent contractions from coitions, as those from a stone &c as will be hereafter taken notice of when we are considering the diseases of the urinary parts &c. Muscles also waste if the joint they serve is rendered useless because their action can be no longer performed.

XCVI. The more distant any part is from the centre of its energy, the less fit will it be for certain actions, as indeed it will receive less energy, therefore all the vital parts are near the heart: all the parts intended for acute sensation, near the brain. So morification from debility more frequently attacks the extreme parts, especially if the patient is tall. Perhaps one reason for this may be that the blood loses somewhat of its nutritive powers before it arrives at them. —

XCVII. In the animal body there are certain actions which proceed from certain fixed principles in the Animal Economy and are regulated by certain fixed laws. There are also actions which arise in consequence of other actions which we call Sympathy.

XCVIII. There is also another kind of action which we call habit. Actions frequently repeated in any part, induce a custom of acting in a given manner in any certain part. From this, accustoming a part to any such action, habit arises. —

XCIX. Habit is a kind of force or violence done or super added to the first principle. Parts from habit acquire a power of acting in a more forcible, or in a different manner from that which primarily took place in them.

C. This habit may be called a species of memory. As memory consists in a repetition of ideas once taking place in the mind. So habit consists in a frequent repetition of action in any moving part of the body. —

CI. Habit is similar to a body once put in motion, which will not cease from motion, ~~un-~~ less some new cause for obstructing motion arises.

CI. — Habit becomes a cause not only of motion in parts accustomed to that kind of motion

3/- but also may be a cause of rest at that time
in other parts. Like a body once put in motion
it does not require a renewal of the same, and
equal degree of force which first gave it motion,
but the addition of a small quantity of fresh
force is sufficient to keep up the motion.

CIII. Habit will even become a cause of action in
the will. It will make those actions of it voluntary
which were involuntary, and also the reverse. The
strength of habit will be much or little, in pro-
portion to the impression of the violence which
gave rise to it. When stimuli are often re-
peated they lose the power of producing sensation,
— hence the mind is at last insensible of the
change, — hence habit of diseases arises (1489) and
parts get into ego or (without the mind perceiving
it) in a diseased action, — hence also parts become
insensible even to noxious stimuli: to the frequent
repetition of which they have been accustomed. —
hence whilst in strangers the bites of the bug &
mosquito produce disagreeable effects. Those who
have been much subject to the application of their
poison have their skin at last insensible to it, as
in the body, so in the mind. Horrid sights at first
produce in it the greatest changes, but by frequent
repetition of them the mind becomes reconciled to them,
and at length scarcely an idea is excited by their
impression. (148). —

CIV. As in the memory it is not necessary that in order to the recollection or renewal of an idea, the impression which gave rise to it should be repeated with its full force, so with respect to habit in parts, it is not necessary in order to excite them to an equal action, the impression or stimulus should be equally violent, with what it was when it first produced the action in the part. Habit is always gaining on us and little force is necessary to keep it up. -

CV. As in the mind the remembrance of impressions which were of little force wears off, unless the impression is repeated before the effect of the first impression ceases, and consequently memory of the impression will not remain, so neither will the power of habit remain, if second impressions are not repeated before the first ceases.

CVI. In accustoming parts to habits impressions two circumstances will arise.

1st If the impressions are slight & often repeated, or if the force of the impression be each time gradually augmented, the parts accustomed to them will become by degrees insensible to them, so that here the cause will remain tho' the effect diminishes or ceases.

2^d The effect may remain tho' the cause ceases, as violent impressions will continue

to produce their effects long after they themselves have been removed. According to the kinds of habits complied with, health or sickness will be induced.

CVII. All stimuli will not produce the same effect when applied to different parts. Hunger will be a stimulus to the stomach alone, light to the eyes, sound to the ears &c.

CVIII. Dispositions in the mind will arise from ideas produced from certain impressions given to the brain. A disposition taking place may be compared to the state of an elastic body when altered from its primitive to some other figure. The disposition of the elastic body to recover its primitive state is destroyed by its action in recovering that state. So when the disposition has produced such a state of the will as to excite the moving powers to any action, the disposition no longer remains, with this difference however that the elastic body loses its disposition instantaneously, the animal by degrees.

CIX. When an Action is excited by the powers of the will in consequence of a particular disposition in the mind taking place, the brain, for the seat of the disposition which might before be considered as in an uneasy or stretched state, now returns with respect to the consideration of the disposition to a state of rest.

CX. The blood which is the fluid circulating

40. in the Arteries and veins, is not a passive inanimate matter, but is endowed with a principle of life in itself equally with the solid parts.

CXI. A particular & permanent figure of parts in a living animal is only necessary to mechanical action. — Action is not necessary to the presence of simple life, the blood perhaps has not motion in itself but motion is not necessary to animal life.

CXII. The blood is not only alive itself, but it also by circulating thro' every part of the body, becomes the means & carries life to other parts, thus being the living support of every part of the fabric even the nerves themselves are supported by it. They do not convey life to the parts, but only direct the motions of parts. Without the blood will themselves become dead.

In inflammation the blood coagulates more slowly, yet there is a greater disposition in the parts to separate one from the other. The separation will often be so perfect that if you dip your finger in the fluid at the top during coagulation it will not be at all coloured red. This inflamed blood sometimes be half an hour before it is completely coagulated.

CXIII. Whilst the blood is circulating in the vessels it is always fluid, but it is not always alive whilst fluidity remains. If by any means the life of the blood is suddenly & entirely destroyed, after its death

it will remain in a fluid state. A gentleman died suddenly in a violent fit of Passion. His blood would not ~~not~~ coagulate. Two deers were hunted to death, the blood of neither would coagulate. The blood of animals killed by lightning or Electricity will not coagulate sometimes. But they will depend upon the manner, in which the Electric matter was applied. If so as to pervade at once the greatest part of both the fluids & solids it may produce this effect.

CXIV. Whilst alive it is always fluid. If its life is not suddenly entirely taken away it coagulates as it dies, and the seeming component parts secede from the other.

CXV. Long rest out of the course of the circulation and exposure to the air of the atmosphere occasions the coagulation of the blood. If unexposed to the air blood will remain long at rest in the living body without coagulation.

CXVI. Organization is not necessary to life. An egg is not organized & yet an egg is alive. So blood is not organized yet is possessed of life. Tho the blood in its fluid state has not sensation yet when formed into solids may acquire sensation. Before blood is capable of giving life & support to parts it must have circulated thro' the lungs, when it undergoes some essential change. Perhaps then it first is completely in its second state or vivification.

CXVII. There is a perfect harmony in a state of health between the fluids & solids of an animal body. So also between the blood and its containing vessels. There is also a consent between them in disease when the solids are affected, the blood also puts on a diseased state: thus the blood is as capable of disease as the solid parts are: so also the blood becoming diseased the solid parts also suffer.

CXVIII. As the blood conveys to parts the means of nutrition and growth, so from the blood new solids are formed, when in consequence of a disease or violence there has been loss of the former ones, or when there arises a necessity for their production.

CXIX. Where there is a disposition to union in parts naturally distinct from each other, inflammation will arise which inflammation will be in proportion to the strength of that disposition. The blood passing thro' inflamed parts undergoes a change according to circumstances, and from the change wrought in this coagulable lymph is fitted to be formed into solids. By the solid parts forming this lymph, parts violently separated from each other are again united, and parts before naturally severed from each other are blended together. From the principle of the blood to become solid it may become muscle, bone &c. The blood becoming a solid certainly soon becomes vascular.

A man underwent the palliative cure for Hydrocele & a quantity of colourless fluid was discharged: in two months the vaginal tunic filled again, & upon making a puncture the water appeared bloody. The operation for the radical cure was then performed, and the Testis, being at the same time enlarged, was removed, the Testis was covered with coagulable lymph which was become vascular, for afterwards by injecting the Testicle, vessels in the coagulum were also filled.

Many cases might be given in support of this doctrine. I have seen between the lips of a wound ropes of coagulable lymph, and along these ropes vessels running carrying red blood. The coagulation of blood is one means of stopping Hemorrhages, and producing union & the first intention. On inflammation the coagulable lymph becomes firmer than in health. If the blood appears mottled or spotted as it flows from the arm, it is a sign of inflammation.

CXX. The living parts of the animal both the blood and the solids, being continually wasting, supply is necessary. This supply is obtained by means of the fluids prepared by the stomach. (44) But before the food taken into the stomach can furnish the desired supply, it must undergo two processes.

- 1st Animalization
- 2^d Vivification. - from living

44. matter only living parts can be made. --
CXXI. Sensation is not necessary to life, the blood
may therefore be alive tho' it wants sensation.
Heat. --

CXXII. A certain degree of heat is necessary to the
preservation of animal life whether existing in
fluid or solid matter. -- It has been doubted whe-
ther heat and cold are to be considered as prin-
ciples or only properties of matter. I do not know
that we can consider them as principles. -- If
heat we can only take up our idea of quan-
tity in our speaking of its influence on living
bodies. Quantity of heat has been considered
two ways: -- by our sensations -- by measurement
as the expansion of bodies, especially metals.

Heat is divided into sensible and absolute heat. Our
sensations are not at all decisive on the subject: to
those it is only relatively hot or cold.

CXXIII. -- A certain degree of heat is necessary to
animal life (122) but a greater degree of heat
is necessary to animal action. Before the former
the animal cannot retain simple life: before
the latter, tho' it may retain simple life it will
not retain the power of action. --

CXXIV. Almost every order of animals require
a degree of heat peculiar to itself. Some ani-
mals will not endure their heat to vary much

45.

from a common standard without abolition of the action of life. She requires it heat to keep up to go. A wasp will suffer it heat to vary with the heat of the atmosphere.

CXXV. In the state (221) digestion & generation with other faculties will be suspended and the animal remain in a torpid inactive state.

CXXVI. All animals in themselves have a power of generating heat, when the action of external cold is so great as to endanger the preservation of life. This power arises wholly from the principles of life, for dead animal matter possesses no power of resisting cold. This generation of heat is truly life operating against its destruction.

An explanation of the power animals have of generating heat was attempted 1st By supposing it to arise from friction but between the particles of fluid there can be no friction, nor between the particles of solids can heat be produced by friction if fluids are interrupted. As the wheels of a coach are prevented generating heat by greasing them.

2^d By Fermentation (by Dr Stevenson), but the fermentation of animal substances does not produce heat, 3^d from inspiring atmospheric air. This seems to be contradicted by the following case.

A man had a contusion of his brain: his respiration was exceedingly slow, breathing not above 5 times in two minutes; yet he had

46. a general warmth upon his skin, tho' in the month of February, and the cloathing was but thin. - The power of generating heat & cold depends simply on the principles of life independant of circulation, the influence of the nerves &c. This is finely illustrated by the case of a gentleman who was seized with an apoplectic fit whilst he lay insensible in bed. His whole body (tho' covered with blankets) would in an instant become extremely cold in every part, & continue for some time, and in as short a time become extremely hot. This was going on for some hours alternately, yet there was no alteration in the state of his pulse or in the excitability of his sensations! -

CXXV^{II}. The heat of all animals is diminished during sleep, whilst in a state of torpor, but more or less in different animals.

CXXV^{III}. Variations in the atmospheric heat will produce different changes of the heat of different animals. Some animals, as man and those that are constantly in action have their heat little changed by this variation. In animals which are in a state of inaction during the winter, as sleeping animals, the heat will vary with the season. The heat of the hedge-hog in summer is from 91° to 97° in the winter when the atmos-

47 sphere was 46° , the heat of the same animal was 45° . The experiment was made on its pelvis.

Animals who suffer their heat to diminish with that of the atmosphere, suffer it to be as readily increased to a certain degree as that of dead matter. A living and a dead carp were both placed in a mixture of snow & water, which was gradually heated and both rec'd heat, one as fast as the other. Different Parts of the same body will have different degrees of heat, and different powers of generating heat. The properting parts of ^{the body in} man, as the nose & penis will be colder than others parts. The urethra will be colder than the rectum; the rectum than the abdomen. The standard of heat in the centre of the human body is about 99° .

CXXIX. Animals will suffer their heat to sink below the freezing point before they will be frozen () In upon eggs.

CXXX. The stronger & more healthy the internal powers of the animal, the more powerfully will it generate heat.

CXXXI. Cold applied to animals in a certain degree proves a sedative to powers of life, but applied beyond that degree it proves a stimulant, and the faculty of generating heat is excited in an extraordinary degree.

CXXXII.. Excess of heat may prove destructive to animal life as well as too great a diminution of it. The principle of life is therefore endowed with the property of generating cold, when the external heat endangers the life of the animal.

Animals have two powers of resisting heat, ~~they~~ only one of producing it. One by the evaporation of fluids; but as when fluids become condensed on the surface, instead of being evaporated, they will not answer the purpose they were which is of actually destroying heat. As the extremities or projecting parts are more subjected to be influenced by cold so they more readily allow their heat to be increased than the central parts. — From Dr Fordyce's Exp^{ts} in a heated room, it appears that the human body will for some time bear heat with impunity, and such heat as is sufficient to boil eggs or roast beef-steaks. The Gentlemen present in it, found that when they moved from one place to another, in the latter they found the heat also more intense than that in which they had some time been standing seemed to be when they left it. So also in the hot bath, the bathers find the water immediately in contact with their bodies cool, & they must either have the water agitated or move into another part of the bath to preserve the first sense of heat. —

49 CXXXIII. Neither excess of heat nor excess of cold will destroy the life of an animal until the powers of generating cold or heat are exhausted, then the animal must of necessity perish.

The operation of generating cold seems to weaken an animal much more than that of generating heat. Before an animal perishes in consequence of cold, sleep is induced, an irresistible disposition to which always comes on when the powers of action for the generation of heat is exhausted. The case of Dr Solander & the people with him at the Terra del Fuego is a manifest & melancholy illustration of this. After bearing for a long time an excess of cold several of the Doctor's attendants found this disposition to sleep. In spite of his remonstrance, who was aware of the event to which it was a prelude, they lay down & slept & presently died. At length Dr Solander felt & gave way to the same disposition. He had not been asleep above five minutes before his feet became so contracted that his shoes fell off them & he lost the use of his limbs; he was however found, brought away to the fire & relieved.

CXXXIV. All the perfect animals carry on their actions, in an atmosphere considerably below the temperature of their bodies; for it seems natural & healthy action, for an animal to be constantly exerting itself moderately in the generation of heat.

CXXXV. Different animals as above mentioned either preserve a standard heat, or have their heat increased or diminished with that of the atmosphere. Yet all animals require a certain degree of heat for the standard in which their functions are best performed. Many animals are obliged to the atmosphere for a standard heat, whilst man & many of the perfect animals have from their faculty of generating heat & cold a power of giving a standard heat to themselves.

The best atmosphere for the human subject seems to be 60° to 63° . Bear & Fox 50° . Lion & Monkey 70° . The animals inhabiting cold climates have stronger powers of generating heat, than the human, preserving every part of their bodies free from injury in countries where men are losing their hands, feet &c from cold.

Cold climates cause the hair of the Bear &c to grow much faster & finer. Hence they are better protected.

CXXXVI. The effects of a climate will correspond in a great measure with the influence of the sun in that climate. so that as the climate is exposed in a different manner to & is differently acted upon by that body. it will be hot or cold; moist or dry; or it will be hot & moist, or hot & dry.

Between the tropics the heat is greatest. In Islands the heat or cold is always more moderate than

in continents. Some vegetables have a power of living in both extremes of climate. Some animals seem also to have this power. Perhaps animals of paper as birds & fishes, change their residence more for want of proper food than from the inconveniences they feel from a given climate. Some animals which have no power of getting their food in the winter, nature has given a power of remaining during that season in a torpid state. As the power of generating heat is not equal to the degree of cold, nature has taken another method of preserving animals at the very frigid climates with down, fur &c. which are bad conductors of heat. &c. also whatever animals have their bodies well covered with hard fat, which is also (as all oils are) a bad conductor of heat.

Too much external heat produces diseases of the liver, spasms, diseases of the bowels, tetanus &c.

Diseases of climates are more slow in their action, and many of them depend upon debility, as chillings &c. Cold climates also increase disease they are not the cause of, as the Venereal disease &c.

CXXXVII. The effects of heat & cold will be greater according to the degree of the surface of the climate. A small surface will be less hot or less cold than a larger.

CXXXVIII. The effects of climate will be very great

in animal bodies. The imperfect animals bear changes of climate very badly; man & many quadrupeds can accommodate themselves to almost any climate. Yet great changes of climate prove the causes of diseases & destruction both to man & those quadrupeds, especially the former.

CXXXIX. Besides our being influenced by heat & cold our bodies are surrounded by, & subject to the influence of the atmosphere which will always be at the same temperature of the climate we live in.

CXL. This atmosphere having the power of absorbing a variety of bodies will be composed of many heterogeneous particles.

CXLI. The atmospherical fluids having a constant powerful influence on the animal body, according to the nature of the particles of which it consists it will materially affect the health of animals.

CXLII. All bodies which the atmospherical fluids take up and dissolve are to be considered in a state of volatilization. To render substances volatile some degree of heat is required (perhaps the lowest degree is sufficient thus to operate on some bodies) according to the degree of heat the atmospherical fluid or the air will be enabled to take up a greater variety & a greater or less quantity of bodies. —

53. CXLIII. The purity ^{or} impurity of the air will depend upon the quantity or quality of bodies dissolved in it, and its capacity of dissolving them be according to its heat.

CXLIII. Cold climates were for the reason given (139-140) ceteris paribus, found the purest air and best adapted to maintain health, nevertheless.

CXLIV. Heat in warm and dry climates has the property of causing bodies taken up by, and dissolved in the atmospherical fluid to be decomposed, and thus changing their nature renders them less noxious.

Thus the plague, jail-fever &c are unknown within the tropics. And the reason why hot climates are not so subject to putrid and contagious diseases as might be expected, ^{is that} the Termites described by Mr. Swinhoe, eat up and destroy in a voracious manner amazing quantities of dead animal & vegetable substances, thus preventing them becoming putrid enough to throw off volatile noxious particles; for before any animal substance can throw off noxious vapours to produce contagion it must be highly putrified.

CXLVI. Heat & moisture especially when dead animal substances are acted upon by the air, produce the most unwholesome atmosphere. —

CXLVII. The air will be injurious to the health of animals by affecting them in three distinct manners. viz.

- 1st by its being simply impure it opposes the fitness of them for their several functions. -
- 2nd by its containing specific particles of contagion.
- 3rd by its containing poisonous vapours. -

CXLVIII. Habit & custom are very powerful in enabling animals to endure without detriment impure and unwholesome atmospheres. To some atmospheres animals cannot be brought to accustom themselves.

Habit & custom. — Prisoners have carried the seeds of jail-fever, & communicated it to others by their clothes tho' they themselves were free from it. of this we have had memorable instances at the Old Bailey & at Oxford Assizes. Again, persons who have never had the small pox themselves have nursed others labouring under it with impunity. & have on visiting other people who have never had the disease, communicated to them the contagion.

CXIX. All irritating substances, will not act in a state of vapour, or are not capable of volatilization.

CL. Water in greater or lesser quantities chemically combined with air. When a decomposition of this ^{combination} ~~decomposition~~ of parts in air takes place. rain is produced. Previous to this decomposition animals are

55 sensibly affected: but things very much so. The human subject unless unhealthy rarely perceives much difference.

Thus previous to a shower of rain we see the beasts running to the covert, the birds flying to the thicket. People with corns are capable of perceiving this decomposition of the atmosphere and also parts labouring under general debility. Hence, doubtless, people who have had fractures, know the part where the callous was formed sensibly affected on changes of weather. Is not this because new parts are weaker than original parts as will hereafter be shown.

CLJ. The decomposition of substances in the Atmosphere may be succeeded by new compositions from which various may arise - Hence to determine, a priori, the effects of atmospheric air is extremely difficult.

CLII. Noxious vapours taken up by the air of one climate may be conveyed to another: thus winds by bringing noxious particles in their current from distant climates may materially effect and alter the salubrity of any given region.

The Harmattan, a wind which blows from the Interior Coast of Africa, shews how much wind may affect animal bodies. It continues from two to three days to 15. returning three or four times a year. It blows moderately; its accompanying fog & gloom are very considerable. Surely this fog & gloom cannot be *Animacula*, as we do not

find any thing produced by them. Not the least moisture can be found in this wind, it makes the lips and fauces dry & chapped; if it continues three or four days the cuticle peels off: continuing a few days longer the perspiration becomes acrid, and is so to the taste. It is yet highly conducive to health. — Convalescents recover fast, also those labouring under Intermitents, Dysentery &c are cured. It checks epidemics. A number of people are inoculated at the accession of the Harmatan, but the small pox did not appear: some inoculated after the wind ceased & recovered perfectly, except one Girl who died of a festering Ulcer in consequence of a large ulcer from inoculation. —

CLIII. Matter will be found either in a state of perfection or imperfection: if in a state of perfection health is present, & in a state of imperfection the reverse or disease takes place. This maxim is universal: it will therefore hold good respecting animate as well as inanimate matter.

CLIV. In order to disease being present, three circumstances must take place

- 1st Susceptibility of certain impressions
- 2^d Disposition arising from these impressions
- 3^d Action in consequence of Disposition.

57

CLV. In respect to these requisites the body bears the perfect analogy to the mind, which must be susceptible of impressions; must receive impressions; must have a disposition arising in it, which an action of the proper kind must succeed.

CLVI. Susceptibility of impressions, ~~must have a~~ ^{is not sufficient} ~~power alone~~ ^{is not sufficient} ~~to produce disease~~. But impressions of some kind ^{must} be rec'd by parts endowed with that susceptibility, which a disposition being produced, an action naturally succeeds.

CLVII. Diseases being a perversion of the regular laws of nature observe less order. Therefore phenomena are less easily to be explained, and accounted for than natural actions.

CLVIII. With respect to the changes taking place in the body we know only the causes of them & their effects. We know not the manner in which those causes produce those effects.

Thus a sprain gives occasion to scrofula, a blow to cancer &c. Moreover different parts will be more or less liable to disease, as they are more or less able to resist a diseased action. This will be in general in proportion to their strength and weakness. - The different parts of the body may have their natural actions very dissimilar, yet disease may produce a similar actions in them. For instance the lungs and the liver have dissimilar natural actions, yet disease produces a similarity of

actions when they are affected with scrupula, a disease to which they are both susceptible, which is a specific affection.

CLIX. We can judge only from the consequences of impressions of the degree of susceptibility of the mind or body. The causes of actions in the body bears a ~~strict~~ analogy to the causes of actions in the mind.

CLX. As the human body is compounded of parts very essentially different the one from the other, the diseases of different parts will vary very widely, so also the constitution of different bodies greatly vary, and of course the susceptibilities of different impressions. On some the susceptibility for particular diseased action is so strong as only to require the habitual actions to be obstructed to run into disease.

CLXI. Constitutions will be either universally subject to the same action as the indolent & irritable; or constitutions will be subject to some specific kind of action whether local or general.

CLXII. Constitutions are both generally and locally subject to particular actions.

CLXIII. Constitutional susceptibility may be threefold.

1st Universal tendency for diseased actions

59. of some kind or other, where however the whole must be in action.

2^{dy} Universal susceptibility of local actions

3^{dy} Universal susceptibility to fall into an universal disposition as tho' something was trying the Constitution as an inflammatory fever.

p. 268
CLXV. Dispositions are natural, unnatural or diseased. Of the natural dispositions of sensitive or movable parts instances are given in the secretion of Glands.

The unnatural are divided into 3 kinds.

1st Disposition to restoration in parts injured as in fractures &c.

2^d Disposition from necessity as in ulceration.

3^{dy} Unnatural dispositions of all kinds of which great is the variety. - The diseased disposition is that which tends to the destruction of parts. -

CLXVI. Every disposition to diseased action has a certain time allotted to it, in which that action will be produced: in some sooner than in others.

CLXVII. A disposition once formed will go on to action and to ultimate action be produced, notwithstanding some time interposes unless the disposition can be destroyed by some change effected in the part or in the constitution where it has taken place.

A girl in the West Indies had a disposition formed for leprosy, but it was some time after she came

To England, that the disease appeared: here there was a considerable space between the disposition and action of the disease. In some specific dispositions organs may intervene before the action commences as in cancer.

We should be careful not to confound dispositions with actions. Dispositions are properly the disease; action the effect of the disease: - Disease may exist for a time tho' its action be superadded, as in agues.

CLXVIII. On diseases, dispositions and their consequent actions are of three kinds

1st When the disposition has its action frequently repeated, without the disposition itself being destroyed by that action taking place.

2^{dy} Where disposition is destroyed by action, & the action ceasing the disease also ceases.

3^{dy} Where the different action continues to go on without removing the disposition, until the progress of it is destroyed by medicines.

Of the first we have instances of the small pox, measles, Inflammations & Fever. Of the second in agues, where the disposition to action continues, tho' the action only commences & goes off at stated intervals, the disposition in the system for action

61. remaining undestroyed by the action until it has lost its power of exciting the system to action, the disposition exists as much between the fits as driving them. Of the 3rd we have instances in some specific diseases as the venereal (Gonorrhoea excepted) Cancer & others, where the disposition notwithstanding the action, continues to exist, because it cannot produce its full effects - hence it will go on until it destroys, without the disposition is removed by an immediate increase of action.

Willan's
Diss. of Scars
p. 38.

CLXIX. Two different and opposite actions cannot go on at one time, neither in a part nor in the whole: If by any disposition a new action is produced the first action ceases.

CLXX. If two dispositions are excited by impressions not two different & natural actions will be produced at one time, but a third simple disposition & consequent action will be generated, which will be entirely and altogether distinct from the other two.

Of this we have an instance in Dover's Powder - it consists of Opium & Spicacuanha - a narcotic & an emetic. Stupor & vomiting shd be the actions, but as two actions cannot take place at one time a ~~third~~ ~~action~~ disposition to a third action arises which produces that third action, and is called sweating.

CLXXI. - Of susceptibilities for disease there will be great variety as above said (163) for every disease

62. there must be first a susceptibility.

CLXXII. In diseases either too great or too little a degree of action will take place, and to these two general kinds of action, all the phenomena of diseased action may be referred.

Too little action in any part produces weakness in it, which altho' not a disease itself becomes the cause of disease. It causes irritability, and thus gives rise to morbid & irregular affections as locked jaw & Mr Hunter says that if the nerves are weak the voluntary parts suffer; if the stomach is weak the general system suffers.

CLXXIII. Diseased action will be common or specific. Specific actions follow certain determined dispositions arising from peculiar kinds of impressions.

Inflammation arises from too great a degree of common action: if a specific action accompanies it, a specific inflammation will take place.

CLXXIV. When a part unused to a particular sensation, has that particular sensation, the first alarm or knowledge of disease is given to the mind: but the action of disease is often so slow, as not to be sufficient for a long time to produce any sensation in a part.

By increased actions in parts, we become sensible of their actions which before we were insensible

63. Thus a palpitation of the heart makes us sensible of the Heart's action. Of this we have no perception in the natural state of the Organ. The whole body being subject to similar actions with those arising ~~from~~ in parts as observed (17) The first attack of a disease is probably intimated to the mind by the feel of Health. Previous to the attack of some diseases it is not unusual for persons to be sensible of an uncommon degree of Health & Spirits. Here the animal powers are as it were summoned into action to resist or destroy disease.

CLXXV. The whole animal body will be subject to many actions & degrees of action, similar to what arise in parts.

CLXXVI. Whenever a part heretofore subject to the will takes on involuntary action, the disease is called nervous.

CLXXVII. Whenever the action of a part is superior to the strength & power of a part, debility, perhaps the destruction of life of the part will arise.

CLXXVIII. A diseased action in one part may first produce a particular sensation in another part - thus the first knowledge of disease will often be conveyed to the mind by Sympathy.

Sympathy will hereafter be more fully explained, but an example in explanation of the text may be given; in the pain of the knee being often the first symptom of a disease in the hip-joint; or again, by passing

a breeze thro' the uterus, something being excited, altho' there is no pain.

CLXXIX. Actions are not hereditary; but susceptibility of impression, the cause of disposition, the cause of action may be hereditary; thus diseases are not hereditary; but a susceptibility of impression, which is to produce a particular disease may be hereditary.

A variety of diseases has been considered as hereditary, but it is only the susceptibility of any disease, so that the child shall be more susceptible of an impression, producing that disease than other people; this is all that parents can communicate to their offspring. Mania has been supposed hereditary, and in some it seems to arise spontaneously without any apparent exciting cause, as impression. An explanation of this will be found () where it is said that in some the susceptibility for a given disease is so strong that they will run into it without any other exciting cause, than simply some obstructions to the natural actions.

The small pox is equally hereditary with mania or scrofula. The gout is also considered hereditary but it is generally otherwise brought on by irregularity in living; but it sometimes arises in persons under 18. here it must be considered hereditary in the same manner that we have considered Mania to be hereditary: originating from a strong susceptibility of the given cause, ready to

65. take it on without any visible cause, and only from some unseen one, as the least obstruction to the natural actions. The Gout is a disease of the constitution, until it falls upon a part, and then the full action thereof being produced, the local affection relieves the constitution.

CLXXX. When the different specific impressions naturally productive of two distinct specific dispositions, are given to the system, two distinct dispositions to specific actions may be found, but the action of one will be suspended during the action of the other; that being finished the suspended disposition may produce its action.

The small-pox & measles cannot exist in action at the same time, but one disease will be prevented from action, until the other has gone thro' its natural course.

Case 1st Mr Prols was inoculated for the small-pox, in a few days the uricæ round the puncture appeared, but he was attacked with measles & suspended for a considerable time the eruption of the small-pox, which however on the decline of the measles, appeared & went through its usual progress.

Case 2^d a lady was inoculated for the small-pox. the measles appeared soon after & the further process of variolous infection was suspended until the measles were over.

Case 3. A boy was inoculated & the same events took place

CLXXXI. Actions must always correspond with dispositions; if the dispositions are simple, so will the actions also.

CLXXXII. Too great or too small a degree of natural action will cause a disposition to disease.

CLXXXIII. In health there must be both a due degree of strength as well as susceptibility of action. Moreover the actions must be always in proportion to the strength.

CLXXXIV. The human body is continually undergoing some changes. It has been considered to be either in an increasing state, as between birth & manhood, when its parts are continually increasing either in bulk or firmness; to be stationary, or preserving with little alteration its strength & firmness during a certain period; or lastly, to be decreasing when it loses gradually its strength & firmness. But these three states or conditions of the human body are not explained by proofs. It is difficult to say when the body in all its parts is arrived at its perfect state, and it is difficult to say that the body as soon as it is attained to its perfect state, does not begin immediately to suffer. tho' for some time, an insensible yet a real and gradual decay.

CLXXXV. It is certain, however, that at different periods of life, the susceptibility of the body for different dispositions will be very different.

67 - hence different ages will have diseases in some measure peculiar to themselves, and these may be divided into

- A. the diseases of Youth
- B. the diseases of Manhood
- C. the diseases of Old age.

CLXXXVI. The diseases of the first & last stages (185) are many, those of the second are fewer.

The diseases of the first stage is peculiarly subject to are scrofula - consequently diseases of the lungs - complaints in the bowels from worms &c. Hydrocephalus. The young are more disposed to local, & especially universal sympathy.

The middle age have few specific diseases, if we except nervous & hypochondriacal disorders. They are however accidentally attacked with the complaints of youth & age, & this lays the foundation for disease in a more advanced age.

In the aged we have a paucity of diseases. Here the necessary actions are not well performed. Diseases proper to this stage are Cancer, Calculi in the bladder & Gall bladder & ducts, ossification of Arteries &c.

CLXXXVII. The causes producing disposition to diseases are many & various. When impressions are given which are to produce diseased dispositions, the dispositions will vary very much according not only to

68. the constitutional or natural susceptibility of the body, but according to other circumstances.

Diseases will vary according to the seat of the action, some parts being more susceptible of particular diseases than others, thus the Lymphatic Glands are the seat of Scrophula, the Skin and Lungs of the measles.

CLXXXVIII. Whatever can affect or alter the natural susceptibilities of the body, will produce variety of disease: therefore the difference of climate, season the moon, the atmosphere will produce differences of disease, and each absolute state of climate atmosphere, moon, the year will have disease or or appearances in disease peculiar to itself.

Moreover affections of the mind will often produce diseased actions: the weaker the natural powers of action in a part are, the less able will that part be to resist disease: therefore tendons, bones &c. have less power to resist disease than muscles.

Climates. — Climates are hot, cold, temperate. In hot climates the involuntary actions are carried on with more violence, whilst the voluntary actions are ~~carried on~~ more sluggishly performed. So diseased actions are carried on with more rapidity & violence — hence diseases run thro' all their stages with more rapidity & violence in these climates than in others. When disease kills ~~at last~~ absolute death (that is putrefaction) quickly succeeds

69. visible death. Cold climates have not such a variety of diseases as hot ones; neither is the progress of them so rapid. Cold invigorates the voluntary actions, at the same time that it lessens the violence of the involuntary ones.

In cold climates simple life is not destroyed until some time after visible is departed, for putrefaction does not so soon follow as in hot climates.

Temperate climates from the irregularity between heat & cold, furnish us with a greater variety of diseases than either of the others. - hence scurvy, colds, agues & such like diseases abound.

Seasons. - We must consider a change of season a change of climate; and as in changes of climate dispositions formed in one climate, by running into another, are retarded from coming into action; so returning into one similar to the first go through their action.

The Spring, as it were, ripens diseases and brings them into action; for a disposition may be formed during a season which had not sufficient influence to bring it into action, as the winter. But in a season more favourable to the forwarding that disposition, as the Spring, that disease has been brought into action. So also is it in climates.

The moon becomes often the immediate cause of diseases, especially those in which the mind is particularly concerned, as in madness, which is

always more violent at certain times of the moon. The full of the moon also affects people whose brains have been injured by any external violence: this was instanced in a lamp-lighter, who rec^d. a fracture of the Cranium with concussion of the brain. He was supposed recovered, but died after four days himself much affected by the full of the moon. The seasons of the year affect the influence of the moon on the human body. The lamp-lighter was additionally affected in spring.

A person of very scrupulous habit was very subject to deafness at the full of the moon except in autumn.

Affections of the Mind. - Every action voluntary or involuntary may be affected by changes in the mind. By a peculiar state of it Rushing may be produced. Other states of it excite vomiting, sickness, irregularity of pulse, diarrhoea discharge of urine, spasms &c.

Diseases on which the mind has the greatest influence are those in which increase or diminution of action takes place, without any alteration in the structure. - Punctuations that are called irritable, have the active parts more under the direction of the mind, and less

under the command of the will. The state of the mind greatly affects the involuntary actions, that have already taken place in consequence of disease. Agues have been cured by affections of the mind. Local affections are even altered by the same means. Gums have been cured by rubbing them with a dead man's hand.

CLXXXIX. Diseases are

A. Local

B. Constitutional, or

C. Mixed.

We judge of the presence & nature of diseases by their symptoms. A symptom is a sensible effect of a peculiar action. Symptoms are either to be referred to the mind, or to the senses; the former only known by the patient as pain &c. the latter perceptible by the physician as the state of the pulse &c.

When the symptoms are not expressions of the ^{local} disease we call them anomalous. Symptoms are either or universal.

CXC. In simple local diseases a part may suffer, the general health of the body still remaining unaltered. In the mind both a part & the constitution is affected.

CXCI. Diseases may be originally local or originally constitutional; or again they may be constitutionally universal, or constitutionally local; or

lastly they may be originally local and at length affecting the general system become constitutional.

CXCII. The original local (191), & the originally constitutional may arise in the same person at the same time independant one of the other.

CXCIII. Dispositions as above said must be formed previous to the existence of disease, so that there will be a disposition to produce originally local effects, an universal disposition to produce local effects &c.

CXCIV. An originally local disease may take on a part of a constitutional one when the former has been only common diseased action. But a local specific disease will not take on a part of a specific constitutional disease, unless the latter has superior powers in which case the former local action will be suspended during the presence of a new specific action.

CXCV. A constitutional disease may increase or diminish local disease; and a local disease may be the cause of increasing or diminishing constitutional disease.

This should seem to refer only to common diseased action of which we have an instance in fevers, curing or increasing an ulcer, or a sore increasing.

CXCVI. It frequently happens that a local disease disappearing some other will appear.

73. CXC VII. A diseased action once formed will go on increasing until either it is destroyed by a new action being induced in a part or constitution, or until the parts to which it is spreading lose their susceptibility of the disposition to that action or until it produces an abolition of life.

CXCVIII. Diseases will be either common or specific.

CXCIX. We cannot increase specific diseases unless we can increase the susceptibility of the constitution of these diseases.

Every specific disease will have two modes of action, the specific & the common.

CC. If the constitution or a part is susceptible of impressions from a peculiar stimulus, and a peculiar action is excited, then a specific disease may be produced & that specific disease may be either local or constitutional.

CCI. When (A.) an impression is given to any part susceptible of action, and the action is not produced in the part to which the impression was given but in some other part.

CXXVII

Or (B) when an action performed in one part produces an action in another part, or when an action is formed in one part and the sensation resulting from that action is felt in another part, Sympathy takes place.

As in disease of the hip (A.) where it is not common thing to have the patient complaining of his knee.

As when (B.) a stone in the kidneys produces sickness & vomiting; as an impression given to the urethra produces often a swelling of the Testicles, tho' the urethra at the time the testicles became swelled. Shall be free from complaints.

CCII. The part (261) rec^d the impression is the sympathent, the part in which the new consequent action, or the sensation arises, is the sympathiser.

CCIII. A. — Sympathy is simple or compound.

B. — — — Similar or Dissimilar.

C. — — — Regular or Irregular.

D. — — — Natural or Unnatural.

E. — — — Real or Seclusive

F. — — — partial or universal.

G. — — — Contiguous. Continuous or Remote.

H. — — — Common or uncommon.

CCIV. The more simple the structure of the being which is the subject of the operation of sympathy the more simple will be the sympathy found. Even some vegetables are susceptible of it, as the sensitive plant, whose leaves successively dropping on approach of the hand, arises from this simple sympathy between the different leaves in successive order sympathising with one another.

75. CCV. In the more compound beings, as the perfect animals, the sympathy may be more complicate; for an impression being given to a part it becomes the cause of action in another part; the action in the last part becomes a cause of action in the third part, and that again in a fourth part. — hence in many animals sympathy may become exceedingly complicate.

CCVI. When a part rec^d an impression an action is formed in it, and a like action is consequently produced in another part, the sympathy is similar, but when the action in the one or sympathiser is different from the action of the other or sympathent, the sympathy is dissimilar.

If one part is affected with pain & another part by sympathy gives the same sensation, then the sympathy is similar & vice versa. A pain in the testicles producing by sympathy sickness in the stomach in the stomach, the sensation and action of the latter being different from those of the former, the sympathy is dissimilar.

CCVII. When an action of a peculiar kind in the sympathiser has always been observed to follow an impression & action of a peculiar kind in the sympathent, such an action in the Sympathiser arising consequent on the impression & action in the sympathent is called common sympathy: as also when

76. a particular part being the sympathent, another particular part has been observed to be constantly the sympathizer.

We observe affections of the brain produce sickness and vomiting, and thus almost invariably—here we have an example of common or ordinary sympathy. By attending to this division of sympathy, we learn a knowledge of the symptoms of diseases. Some common sympathies, tho' but few, arise in consequence of disease only, and are therefore unnatural: such is the sympathy between the shoulder & liver, between which in health there seems to be no sympathy.

CCVIII. When an action of an unusual kind arises in a sympathizer, or when the sympathizer is a part unused to action consequent on an action in a given sympathent, uncommon Sympathy is said to arise.

CCIX. Sympathy is natural when the sympathent receiving an impression not productive of disease, or healthy consequent action is produced in the sympathizer.—Thus the breasts of women are affected previous to the coming on of menstruation.

CCX. Unnatural or diseased sympathy is when an impression given to the sympathent, produces an affection of the sympathizer inconsistent with its

17.

healthy & natural action, scratching an issue in the thigh which itched has produced a difficulty of breathing & pain in the breast.

The father of the great 2^d Chancellor Clarkson had a stone in his bladder: he was afflicted with it many years & when it was painful it was accompanied with a pain in his arm.

CCXI. Sympathy is real when the mind refers to affection or sensation produces to the proper sympathiser; and delusive where the mind refers the sensation or affection to a sympathiser between which & the sympathent no possible connection can exist.

Thus when a man under idiotism or delirium has an impression given to any part of his body, and his mind believes the sensation consequently produced, not to exist in himself, but in some other person, he is under a delusive sympathy.

A man in a fever & delirium when he wanted to go to stool always signified to the bystanders that some other person of whom he talked or to whom he pointed, wanted to stool, referring his sensations to another individual.

CCXII. Sympathy is partial where one or more parts of the body are sympathising, some given part being also the sympathent. It is universal when an impression being given or an action

excited in any part, the whole constitution sympathizes with it: so a wound being made in the knee a fever which is the action of the constitution will often arise sympathizing with a part.

CCXIII. Sympathy is continued when a part receiving an impression & a consequent action arising in it, the parts immediately joining & connected with it are also thrown into action: thus when an inflammation arises in a part as the skin, and spreads wider & wider the parts of the skin to which inflammation spreads from the first point, are suffering by continued sympathy.

CCXIV. Contiguous sympathy arises, where an impression being given to, or an action excited in a part, the part or parts contiguous to, but not joined and immediately connected with the sympathent, becomes the sympathizer: thus an affection of the integuments of the abdomen, will produce consequent affection of the bowels.

CCXV. The sensitive principle, the principle of life and the mind mutually sympathize with each other: so that affections of the ~~mind~~ one will produce affections of either, or of both the others.

CCXVI. Remote sympathy is where the part which is the sympathizer, is distant from the part which is the sympathent as when a diseased testicle

19. produces sickness at the stomach.

CCXVII. Some parts are more particularly disposed to become sympathisers than others; the stomach will sympathize with every part of the body.

CCXVIII. Particular habits are more disposed to universal sympathy than others. The less determined is the disposition to partial sympathy, the greater will be the disposition to irregularity & universality of sympathy. Thus infants are peculiarly subject to universal sympathy, because when an impression is given to any part of their body, their partial sympathies, not being yet settled or determined, no particular part is become disposed to be the sympathiser, but the constitution takes up the sympathizing action.

CCXIX. — The strength of regular & partial sympathy will be greater in proportion to the strength of the powers of life, & vice versa.

I must remark on the text that the strength of partial & regular sympathy will be in ratio of the powers of life. I think here we must make a distinction between a readiness or susceptibility of sympathy, & strength of sympathizing action. Perhaps debilitated & most irritable persons are those in whom the powers of life are weakest, are the most ready to fall into sympathy of every kind; but the strength of the sympathizing action will in them be but little, because the sympathiser can have but little powers of action.

CCXX. The affection of the sympathiser will often be more violent than the action of the sympathiser; but this will depend on the number & nature of parts & parts taking up the action of the sympathiser, & thus becoming the sympathiser.

The brain sympathizing with some other part convulsions, epilepsy, or a sudden abolition of the visible life, may be the event, the action in the sympathiser being here more violent than in the sympathiser.

CCXXI. The vital parts are particularly disposed to partial sympathy between one another. The farther parts which are the sympathisers are removed from the heart, the greater will be the disposition of the constitution to sympathize with them.

Thus in diseases of the extremities, the constitution is exceeding ready to run into hectic fever - as in white swellings of the knees, arms or ankles. But the latter part of the text in the paragraph can only refer to the non vital parts, for the constitution is always most disposed to sympathize, when a part necessary to vitality is affected.

CCXXII. Sympathy being only a secondary action will cease when the first part is destroyed: thus if a diseased or ulcerated joint is attended with hectic fever, quick pulse, restless nights & almost immediately after its removal by amputation

81. the pulse grows slow and calm, and the patient recovers his sleep.

Instances of mutual sympathy are but few; the stomach will indeed sympathize with the head, and the head with the stomach, but the liver is perhaps never the sympathizer when the shoulder is affected, tho' a morbid change in the liver produces very commonly an unusual sensation in the shoulder.

CCXXIII. Sympathy is of many important uses in the operations of life. It connects the principles of different parts; it enables one part to assist another in the expulsion of offending matter; it enables one part to assist another in the performance of its operations: possibly when one part is affected with pain, by enabling another part to take on pain also, and thus diffusing the sensation it lessens its violence: as the same quantity of pain concentrated in one place, might be insupportable to the animal, but by its being diffused over other parts the animal is enabled to endure it with less injury.

CCXXIV. Sympathy leads us to the knowledge of the causes, nature & seat of diseases. By observing in what manner one part becomes affected by a prior indisposition of some other part, we learn frequently, from the sympathiser, the state, situation,

and manner in which the sympathent is affected.
 CCXXV. But sympathy often leads us astray, & causes our judgement to err. When the sympathent is only sensibly affected, we refer too frequently the disease to it entirely, overlooking or not suspecting the sympathent; we are moreover led to imagine from considering the phenomena of sympathy parts to be sympathent which are free from the action in question: so also when the mind of the patient has been long habituated to a particular idea, he frequently but falsely refers many sensations to the same cause, that had given rise to that particular idea which sensations arise from other causes.

Thus a man having been used to fits of the gravel, if seized either with a pain in the back from any other cause, refers his pain to nephritic affection. (See Symptoms.)

CCXXVI. When Medicine or artificial means are employed for the removal of diseases produce either a particular or universal affect. It is to be considered as a kind of violence done either to a part or to the constitution.

CCXXVII. Before a medicine can produce any (except mechanical effects) upon the constitution it must be reduced to a state of solution.

CCXXVIII. There is one property only in all the juices of an animal body, which is common also to one found out of the body, and by

83. the solubility of substances, in which fluids we can judge of their solubility in the animal juices. All our juices are more or less of a watery nature - hence substances soluble in water will also be soluble in the animal fluids.

CCXXIX. But not only the substances (219) are soluble in the animal juices, almost all substances are so in a greater or lesser degree, and most of them are so in the mouth, as we know by their giving the impression of taste, previous to their doing which they must be in a state of solution. No substances having any but a mechanical action on a part, which are insoluble in the juices of that part.

CCXXX. Many substances are soluble in the stomach, tho' insensible, as Earths, which are neither soluble in water nor saliva, & consequently are insipid.

CCXXXI. For a medicine to produce universal effects it must be dissolved in the blood.

CCXXXII. The blood is a kind of universal menstruum for substances being found incapable of solution in it. Its properties of retaining alone so many substances in a state of solution, may arise from its heterogeneous nature; for it is well known that a fluid which has dissolved one substance, tho' it will perhaps take up no more of that substance yet will even by means of

84 that substance be enabled to dissolve a second substance, for which it had been an otherwise improper menstruum. Thus a saturated aqueous solution of sal. Ammoniac. will enable water to take up ^{proportionally} more corrosive sublimate, than water when in its elementary state will do. - So also water impregnated with fixed air to saturation will still dissolve other substances, & even such, as unmixed, it would not have acted upon.

CCXXXIII. Medicines dissolved in the Animal juices have a power of influencing both the nervous & living principle.

CCXXXIV. Medicines ^{perform their operations} ~~dissolved in the Animal~~ ^{by their} ~~juices have~~ by their.

a. Stimulating

b. Irritating, or

c. sedative powers, and by the

animal body having a susceptibility of that operation, but never produce any change, unless they act as caustics by any chemical operation.

CCXXXV. The powers - a, b, (234) are to be found in the same medicine the quantity in which it is applied only making the difference.

CCXXXVI. Stimulating medicines either produce natural action or increase one already present. Irritating medicine alter the

85. mode of an action already present. Sedative medicines diminish action whether natural or unnatural. Each of these may produce both partial & universal effects.

CCXXXVII. The influence of stimulants will be as the power of the stimulant, and the nature & sensibility of the part taken together. The same will also be the influence of an irritation.

CCXXXVIII. The influence or operation of the same medicine on different parts will be extremely different: so also the action of medicine on a second part will differ from its action on the same part when in a state of disease.

CCXXXIX. In order to understand aright the influence of medicine, we must consider parts as capable of suffering four actions viz.-

- 1st The action of Health
- 2^d The action of Irritation upon Health.
- 3^d The action of Disease
- 4 The action of Irritation on Disease.

CCXL. Irritation acting upon Health, produces diseased action; Irritation acting upon disease produces or restores Health.

CCXLI. As parts are susceptible of a variety of diseased actions, the removal of one diseased action

by medicine will not always produce a return of health. A disposition to some other diseased action may have been formed, and waits only for the present diseased action being removed to go on to its proper action. One action can only exist at one time in one part. (169.)

CCXLII. The irritation of medicine on disease may altho it removes the present disease, even induce a disposition to some other diseased action, which as soon as the first action ceases may go on to its action. -

CCXLIII. From (241.-242.) it is evident, we should be careful to discriminate the consequence of disease from the consequences of cure; we may otherwise persist too long in any mode of cure. -

CCXLIV. The powers of the living animal may also be affected by mechanical means. The operation of the application of mechanical means may be reduced to two species. viz. -

- A. That of pressure
- B. - That of Friction.

CCXLV. Both A. and B. (244) produce the same ultimate effects as medicines.

CCXLVI. Pressure seems to impede action. It is also of use as a stimulus. If applied more forcibly it irritates. -

87/ CCXLVII]. Friction does not seem to impede but excite action: if violently applied it irritates: if gently it stimulates. — Friction can be applied to a larger surface than Puffing. —

CCXLVIII]. Medicinal applications may produce their effects either simply by contact, or by exciting sympathy. —

CCXLIX]. It is rarely medicines act simply by contact, their influence being carried by sympathy generally much farther than the parts to which they are immediately applied. —

CCL. The effects of medicines acting by sympathy may be thrown into the same divisions as the actions of sympathy (203.). They will act particularly by continued, contiguous or remote sympathy.

CCL I]. In directing the administration of medicines it is necessary to have respect to the strength & weakness of the parts or constitution, and to the great or the little action of the part or constitution. —

CCL II]. As in health the action of a part must be always in proportion to its strength () so in our endeavours to restore health when impaired, we must always endeavour to proportion the degree of action to the strength. —

We must never increase action when strength is deficient, without endeavouring to increase strength likewise. —

CCLIII. A. — Strength & action may both be diminished and increased.

B. — Action may increase, Strength at the same time diminished.

In one case (A.) it must be our care to increase both strength and action.

In the other (B.) it must either increase the action to the strength, or increase the strength, so as to link it with the action.

CCLIV. Weakness and want of action are not the same: a part may have weakness, and yet too great action. We judge more readily of too great, or too little action: than of strength and weakness, because the former are effects, the latter are often causes.

CCLV. Medicines may act by contact (249) or by sympathy.

CCLVI. Medicines may also be absorbed (see absorpt.) and when absorbed will again exert their action by sympathy or by contact. By contact they may either affect the lymphatics of the part, or as much of the lymphatic system as they pass through: or, again, when mixed with the blood may by contact affect the constitution in general.

CCLVII. There are also applications which penetrate beyond the surface to which they are applied, as heat, cold, Electricity.

89. CCLVIII. Heat increases the vital & involuntary actions. Tho' it is considered as penetrating it cannot produce that effect beyond a certain degree, because the animal is incapable either in a part, or in the whole of receiving or containing a certain portion of heat. -

CCLIX. With respect to cold, also, the same reasoning will apply. The animal power whether in a part or in the whole will neither receive nor part with more than a certain quantity of heat, that is without destruction to its principle of life. -

CCLX. Electricity indeed in any capacity of the animal is universally penetrating, as no circumstance or difference in the capacity of the animal can obstruct its passage.

CCLXI. Cold, heat & Electricity are capable of powerfully exciting action. We must therefore be extremely attentive to the circumstances & degree in which they are applied lest we sometimes excite an action superior to the strength.

CCLXII. Cold applied to the surface of the body may become a stimulant & rouser, or a sedative & weakener.

CCLXIII. In the first instance (262) it produces heat in which it agrees with the warm bath, with this difference, that the latter in some measure gives heat to the animal the former obliges the animal to produce its own heat. Here the powers generating

heat are increased, the pulse quickens, the actions of health are in general increased. These effects show the animal is ⁱⁿ full powers of restoration.

As the cause of these effects is instantaneous, so that the effects will be but temporary, therefore the cold application must at due intervals be repeated.

CCLXIV. In the second instance (262) A proves a sedative and weakener where the parts can give no alarm to which it is applied either to the constitution or the parts; or the constitution have its powers of generating heat diminished. Here all the consequent actions will be the actions of weakness.

CCLXV. Cold may produce various effects by sympathy even local.

CCLXVI. Heat is either absolute or sensible; the latter we shall here notice.

CCLXVII. We judge of the degrees of sensible heat by our sensations or by measurement. This sensible heat is either native or foreign.

CCLXVIII. Foreign heat in its application will produce different effects, as it is applied simple or compounded with bodies capable themselves of exciting action.

CCLXIX. Foreign heat is applied with two intentions viz.

- 1st To increase the warmth of the Animal
- 2^d To act upon the principle of life.

11. Heat has the general property of increasing the violence of the involuntary actions.
In the general properties & effects of heat & cold in animal bodies, see the text and notes on heat-cold & climate.

CCLXX. According to the degree in which it is applied it will ^{be} either irritating or sedative.

CCLXXI. Substances compounded with heat are applied either in a dry or humid state.

Heat in dry vapours can be specified with essential oils. Spirits &c the warm bath is an example of humid bodies compounded with heat.

CCLXXII The bath () is generally used with a degree of heat something below that of Animals, or in a degree above it. The former is called tepid bath, the latter the warm bath.

CCLXXIII. The former seems in general to soothe the skin & by sympathy to affect other parts with an agreeable sensation — hence it rarely depresses, nor does it in general excite any increased action further than simply freeing a part from disease.

CCLXXIV. The hot bath produces more powerful effects. By exciting an increased action on the surface it may produce relief to the internal parts. If continued for a length of time it produces weakness, but not commonly a permanent one.

CCLXXV. It is observed above () that different

92.

parts will be more or less able to resist disease. In the same manner in different parts when diseased there will be more speedy or slow advances towards health, and this from the same cause, viz. the difference in strength or weakness.

CCLXXVI. Parts in which action is excited with the greatest difficulty fall into diseases more slowly, and when diseased are more slowly restored again to health.

Muscles heal or are restored to health more readily than bones or ligamentous parts. The cellular substance will take on the healing process more readily if placed about muscles than if placed about tendons or bone. It taking on in general the disposition of the parts to which it is subservient.

CCLXXVII. Touching the slowness or readiness with which parts diseased recover their health will much depend on their situation in the body.

CCLXXVIII. The power of healing, or the facility with which parts diseased recover their health, will also be different during different ages, other circumstances being similar.

CCLXXIX. This power (278) will be greater or more active during the growth of the subject, than after the growth is stopped: during the middle age or that which is called stationary () (although this is not well ascertained) the power of healing is less active: but it will be the least active of all, during the state of decline when the system seems to take on a

93.

retrograde motion & nature begins to unbuild.

CCLXXX. It frequently happens that one disease shall prove the cure of another.

CCLXXXI. One local disease being produced may remove a prior local disease. A constitutional disease arising may prove the cure of a local disease & and a local disease arising may cure a constitutional one.

(1).—
CCLXXXII. Constitutional diseases cannot be cured while parts are continually adding to the constitutional affection.

A scrofulous joint, an ill conditioned ulcer, an ulcer in the Lungs, or any other similar cause may produce a constitutional affection; and the existing in such a state the constitutional affection cannot be removed.

CCLXXXIII. When loss of substance happens in any part, and that loss is to be restored, the parts which restore the loss, or which regenerate the substance to fill up the loss, in their action for that purpose preserve the same disposition with which they were at first formed.

Thus the Cranium is at first membranous, it afterwards in due time becomes bony, or its bones shoot in membrane. If by fracture, or other violence a part of it is removed, on the restitution first membrane is formed & afterwards bone. So in the cylindrical bones as they were at first cartilaginous, when restitution in consequence of injury becomes necessary, the union is first by cartilage, then by bone. —

94.

CCLXXXIV. The law (283) does not however universally hold good, as certain circumstances being present may prevent its operation. -

If a part of a tendon - is destroyed as by a wound & the injury extending in other parts as the skin, cellular membrane &c the process of restoration being begun the union will not take place by means of a regeneration of Tendon. -

Inflammation.

CCLXXXV. Inflammation is an increased action in a part. It is difficult to determine whether it differs from common action in a part, except in degree.

CCLXXXVI. Inflammation is the first principle in Surgery; it is the cause of many local diseases; it is a means of preventing the increase of many local diseases; & it is often a powerful instrument in their cure. Its operations are chiefly performed by the small vessels, the larger ones doing little more than bringing blood to them.

CCLXXXVII. It may be divided into
 1st The healthy,
 2^d The unhealthy.

~~The first, the action of inflammation alone, the second, the action of inflammation with other modes of action. -~~

95.- The first, that which is attendant on a healthy state of a part of the constitution; the other, that which stands on an unhealthy state of the part or constitution.

CCLXXXVIII.- It may be divided into

1st Single.

2^d Compound.

The first, the action of inflammation alone; the second, the action of inflammation with other modes of action.-

CCLXXXIX. It may be divided according to its effects into

A¹ The adhesive

B. The suppurative

C. The ulcerative

CCXC. The parts subject to inflammation are
a. The cellular membrane & circumscribed cavities
b. All the canals & vessels of the body.-

CCXCI. The three stages or states of inflammation may have a fourth superadded - viz. that of a specific disposition to scrofula.-

CCXCII. In the order (a. 290) the adhesive inflammation generally begins first, the suppurative & ulcerative are its sequels.

In the order (b. 290) the suppurative begins & the adhesive or ulcerative follows.-

CCXCIII.- In the adhesive inflammation coagulable

46 Lymph is, by the increased action of the vessels, speedily thrown out between the surfaces of the parts inflamed & becomes a connecting medium, glues the surfaces of the cavities one to another & thus entirely obliterates them.

By the effusion of coagulable lymph over its gluing up the cavity, or confining the inflammation's extent, is formed, in fact, a cyst to contain in the purulent matter when formed - hence we see how matter is confined to one spot instead of being widely diffused; by it is also formed a cyst round musket-balls, pins, glass &c.

CCXCV. Inflammation is frequently carried no further than the adhaesive (293) & thus it may terminate by what is called resolution.

CCXCV. The adhesive inflammation often prevents an increase of local diseases; checks & bounds to its own progress, and it prevents the diffusion or extent of the suppurative inflammation when it takes place.

CCXCVI. The coagulable lymph thrown out in inflammation (293) always partakes of the nature of the solids which it separates it.

CCXCVII. The termination (294) does not always take place: when it does not happen, if the violence of the action the death of the part does not ensue, the suppurative stage takes place.

97. CCXCVIII. The suppurative stage will arise when the death of a part has actually taken place, but the surrounding parts have not suffered the same dissolution of their vital principle: here, indeed, the dead part may be considered as a foreign substance & is a stimulus to inflammation to those that surround them.

CCXCIX. Particular circumstances arising in different parts of an animal body, the parts may be disposed to absorb themselves, & so to produce a solution of continuity; the inflammation attendant on this action is the ulcerative. (298c)-

CCC. This is commonly the sequel of the suppurative stage & therefore may for the most part be rather considered as a consequence of that stage than as the affection of an original disposition in a part.

CCCI. This (300.) however is not always the case, it sometimes arising without a part previously undergoing suppurative inflammation. -

CCCI. The general order in which inflammation proceeds in the cellular membrane (290.) is

- 1st Adhesive.
- 2^o Suppurative.
- 3^o Ulcerative.

CCCI. But this order is not always observed; the suppurative inflammation will sometimes arise without adhesion previously taking place: here the

98. disease extravasated fluid will be widely diffused. This is the case in the Erysipelatous inflammation & suppuration.

CCCIV. In the canals or outlets of the body (290. b.) the suppurative generally begins, the ulcerative follows, to which the adhesive begins.

When inflammation attacks the canals, it rarely goes beyond the suppurative affection as those parts do not readily fall into ulceration; adhesion will arise still more rarely. The ulcerative inflammation being in those parts so uncommon, granulation of course will as seldom be found to take place.

CCCV. The Erysipelatous ~~affection~~ affection attacking the parts, the order is here also destroyed, the adhesive or ulcerative arises first and the suppurative succeeds.

CCCVI. Whatever can increase the violence of the parts, action may be called a cause of common inflammation.

CCCVII. A part will take on the affection of the constitution, that is an universal affection may become a local one - hence therefore a cause of local inflammation may be traced.

CCCVIII. The abscesses arising after the termination of specific febrile constitutional disease, as small-pox, measles &c have nothing specific in their nature. they only arise in consequence of the common disturbance the constitution itself has suffered from

99. The fever of the disease.

CCCIX. Simple inflammatory fever may be followed by an abscess in a part. 308. —

This arises from a particular original disposition in the part into action by the fever, or by a part taking up an universal disposition.

CCCX. The remote causes of inflammation are four.

1st

From accidental violence.

2^o From Irritation applied to the part.

3^o From a particular disposition in the part itself.

4th From a general state of the constitution affecting some particular part. —

CCCXI. Many constitutions have a disposition to specific inflammation & will fall into it whenever any exciting cause shall arise, as in Scrophula, & habits subject to Erysipela.

CCCXII. Many parts of the body have a greater tendency to specific diseased inflammation than others: so any constitutional affection arising, they will readily take on a diseased specific action.

CCCXIII. Specific inflammation may be

a - Specific and healthy, or

b - Specific & unhealthy.

CCCXIV. Different parts more or less readily take on different inflammations. Internal parts are more inclined to the suppurative, external parts take

it on less readily, suffering even the presence of foreign stimuli along time without going into this stage. Vital parts do not readily ~~admit~~ of the suppurative inflammation. they willingly take on the first almost simple inflammation.

CCCXV. When a part is inflamed that is not essential to life the constitution does not necessarily sympathize with it, unless from the long continuance & violence of the inflammation; for here the operation of inflammation may be carried on without interrupting the functions of the vital parts.

CCCXVI. But if the constitution of the patient is very irritable & readily takes on sympathy, nearly the same phenomena will arise as in inflammation of the vital parts: the pulse will grow small, quick & hard: blood drawn off will be fizy but loose and its superficies flat. The violence of pain will however be greater than in inflammation of the vital parts.

There are two powers which can produce a change in the state of the pulse; that of the Heart, and that of the Arteries. The regularity or irregularity will depend upon the Heart; the hardness, softness & smallness, will depend upon the Arteries.

CCCXVII. All parts supplied with their nerves from the intercostals & plexus vagum when attacked with inflammation give symptoms of lowness & depression. The effects of inflammation on different parts.

Thick, small thread, sometimes low pulse. —
Small Intestines.

Nearly similar —
Large Intestines. —

Pain more acute, general depression lps, nausea &c.

Liver.

This produces besides its own peculiar symptoms, effects somewhat similar to inflammation of the stomach! —

Uterus.

Great oppression, nausea, obtuse pain.

Lungs.

The heart frequently sympathizes preventing a full diastole: when the muscles are inflamed the pain is acute, the pulse full strong. Inflammation of the bones & tendons produces a dull heavy pain, & the stomach generally sympathizes.

CCCXVIII. The termination of inflammation will take place the quicker, the nearer it is to the heart.

CCCXIX. The pulse growing quick after the commencement of inflammation is a proof of the constitution becoming affected or sympathizing.

CCCXX. In the commencement of inflammation vigor is frequently felt; this is not simply from the activity induced in the constitution, but from the novelty of the action, which it performs but weakly, because it is not prepared for, nor accustomed to it.

CCCXXI. In rigors & syncope the blood is collected

about the internal parts the external are left in some measure empty

CCCXXII. Every new action in the constitution must tend to induce weakness in it. Its effects will however vary in different constitutions. In the strong it will excite the general powers of action, & can hot fit will sometimes succeed. In the weak the hot fit will not always be produced, but only a clammy sweat succeed.

CCCXXIII. Rigors are not attended on the commencement of inflammation alone: every new action in the constitution may be accompanied by them.

CCCXXIV. Life cannot go on always in the same state: it must have its stated seasons of rest and action - hence even in the most continued diseases and when the cause is unvaried there will be intervals of alleviation & exacerbation. Nature observing her general law, rests even in disease.

CCCXXV. Exacerbations may be considered as the renewals of the commencement of diseased action & so akin in some measure to rigors.

CCCXXVI. Disease may exist & yet the constitution be insensible to its action. It may want power of keeping the constitution in action beyond a certain time. In aague, the disease exists as much between them as during the paroxysms.

CCCXXVII. From () it is evident that a change arising in the constitution, a change in the blood, as

103. Partaking of & possessing the living principle may take place also.

CCCXXVIII. The appearance of the blood will not always be the same under given symptoms of constitutional affections, such as the state of the pulse &c.

CCCXXIX. Inflammation begins at a point at first, all the local symptoms being confined within a small compass: afterwards it spreads according to the state of the surrounding parts, which may be either local or constitutional. As the more or less disposed to continued sympathy, at length the inflammation spreads will be gradually lost in the surrounding parts.

CCCXXX. Inflammation is attended with a swelling of the part; the more healthy, the swelling will be increased at a point.

CCCXXXI. The swelling of a part arises from the vessels of the part being more distended with fluid than natural from the extravasation of coagulable lymph & some serum which is known from the Edema of the surrounding parts. The less extensive the Edema is and the firmer the margin of the inflammation is, the more of the healthy inflammation will be present, for here more coagulable lymph, and less serum is thrown out.

CCCXXXII. The colour of the inflamed parts (329)

will also be altered: the nearer it approaches to a pale scarlet colour the more healthy the inflammation will be: the less healthy the inflammation is, the colour will be less of the scarlet & more of the Canker-red, inclining to purple & sometimes of a bluish hue.

CCCXXXIII. The change of colour (332) will arise

a. From vessels, which naturally contain only Lymph or serum, carrying red blood.

b. From their containing more blood than circulated thro' the part in its natural state according to the law of the Animal Economy that the more a part has to do the more blood will be given to it. The colour is that of Arterial blood.

c. From new vessels being formed in that part by coagulable lymph becoming organized.

CCCXXXIV. When inflammation attacks a part near the surface of the body, the heat of the part will be considerably increased.

CCCXXXV. But the heat of the inflamed part will not be increased above the standard heat of the animal, tho' compared with the heat of other parts of the surface it will be greatly increased.

CCCXXXVI. An increase of heat in a part does not always arise from an increase of power of action: it may arise from increased action tho' attended with metastases.

CCCXXXVII. Coldness in a part is however in general

arising from weakness & want of power of action; but a part may have its degree of heat increased by its sympathizing with the affections of other parts - as the stomach, changes in the mind &c. &c. -

Mr Hunter threw Tart. Emet. gr. iiii into the veins of a bitch: it soon vomited her, she became convulsed and died: she was astonishingly cold during vomiting and upon opening her (immediately after her death) the heart & lungs were found remarkably cold.

CCCXXXIX. Inflammation is commonly attended by a painful sensation communicated from the affected part to the mind; in the adheasive state it is rather of a dull heavy kind: when proceeding to suppuration it becomes more acute, when suppuration has taken place it abates. When ulceration begins it again increases, but during the latter state it rather gives the idea of soreness.

CCCXL. Every time the Arteries dilate there is an increase of pain - hence the same throbbing. The cause of the pain is the distention of nervous & sensitive parts. -

CCCXXXVIII. The source of heat is probably in the stomach, from whence by means of the circulation it may be conveyed to every part of the body.

The stomach sympathizing with any part of the constitution is probably the cause of Rigor. Rigors are not only produced by constitutional affections, but even by local ones as the pricking of a finger; also by affections of the mind, as fear, turned sights &c. The absorption of any contagion or putrid matter into the system is attended with Rigor. Rigors probably do the same thing in the

106. constitution as something rousing the constitution to greater action. The heat of the blood () cannot be altered by the sympathetic fever, a constitutional affection can only produce a change in it.

V CCCXLI. The disposition of inflammation will sometimes cease before even adhesions are produced, and thus after a part has begun to swell, — this is called Resolution.

CCCXLII. As the increase of pain was a proof of the progress of inflammation, so its diminution is to be attributed to the cessation of the inflammatory state, when the uneasy state is removed the disturbing cause is taken away & the parts return to their state & ordinary actions.

CCCXLIII. The constitution will not only be differently affected by the different situations & functions of the parts inflamed and greater or lesser extent of inflammation, but it will also be differently affected by the different stages of the inflammation present: thus the suppurative inflammation will affect it much more than the adhesive or alcorative, by whose action, in general, the constitution is but little disturbed. —

CCCXLIV. The vital parts subject to inflammation may be divided into

- a. Those readily taking on Sympathy,
- b. Those which do not.

of the latter, the lungs; of the former, the stomach, are instances. —

The pulse will, in general, be harder, tho' smaller under the affection of the former than the latter.

CCCXLV. Whatever can obstruct the natural circulation through the minute vessels, will produce inflammation; its causes therefore may be very different & various. () -

CCCXLVI. When a part perceives any alteration in its structure, or a change in, or obstruction according to its natural function, the stimulus of imperfection arises.

CCCXLVII. The stimulus of imperfection excites in parts new dispositions whose consequent actions are either processes of restoration or destruction according to the strength of the parts & their facility in the act of healing (252). -

CCCXLVIII. Irritation of whatever kind being applied may produce inflammation peculiar to the constitution or condition of parts (31. 34.)

Thus if small-pox matter is applied, if the constitution has a peculiar susceptibility of a putrid disposition the disease will partake of a constitutional disposition as in the confluent small-pox. If venereal matter shall in one person produce a chancre surrounded with common inflammation, in a person of a different constitution it will be accompanied with suppurative inflammation, which may spread to a wide extent. -

CCCLIX. The disposition for restoration of parts injured is the most simple (165) that from necessity is most complicated; but the disposition for disease is the most complicated of any.

CCCL. The stimulus of imperfection may arise in parts from different causes, as obstruction to their natural actions, or from an alteration in their structure by external violence: the latter becomes chiefly the object of surgery, though the former may also fall within its province.

CCCLI. The effects of external violence will be different according as that violence is applied to sound parts or parts diseased.

CCCLII. Mechanical injuries on sound parts may be divided into two kinds.

1st Those which do not communicate externally

2^d Those which do.

To the first may be referred bruises, sprains, simple fractures &c.

To the second, wounds of all kinds opening externally.

CCCLIII. The first division may by circumstances be changed into the second, and the second may be brought back to the first.

CCCLIV. The effects of the first division on the constitution ^{injury} according to the nature of the parts, & the state of the constitution, will be different. If the power of healing in a part is strong, the part injured not vital, and the constitution not highly disposed to sympathize, no material change will take place in the constitution.

109. - and the process of restoration will go on with only local effects.

CCCLV. The second division is much more complex and its varieties will be numerous depending upon the nature & situation of the parts injured, the kind of violence inflicted & the degree of that violence.

CCCLVI. Its effects on the constitution will be determined by the same laws as those regulating the effects of the first class. -

CCCLVII. When vascular parts naturally in contact with each other are separated by violence, an effusion of their contained blood follows the injury.

CCCLVIII. The union of parts violently separated from each other is accomplished either by,

- a. - The extravasated blood being the basis of union,
- b. - The adhesive inflammation, or,
- c. Granulations

CCCLIX. It has been already observed that the blood is a living fluid, & when extravasated it does not immediately lose its living principle. In the separation of parts by violence when blood is effused the mode of union is effected by the red particles and serum being absorbed, and the coagulable Lymph being left, the Lymph becomes vascular and nervous. It thus readily unites the sides of the wound together. This process is accomplished with more ease in the first class of injuries than in

the second, because the blood by coming in contact with atmospheric air the sooner loses its ^{primary} vitality.

When wounds are inflicted it is evident from the text that where the first mode of union is to be effected, the surgeon should bring the lips of the wound in close contact and retain the blood in the wound; then defend the parts from the action of the air. No foreign matter should be introduced - hence the suture must in general be objected to.

Union will not only take place between divided parts of the same body, but also between parts of different bodies with each other. - Sw Hunter introduced the testicle of a Cock into the abdomen of a Hen; the testicle united to the liver of the latter, and some time after when the Hen was killed Sw H. injected the testicle from the body of the animal.

Again, he fixed a tooth recently extracted on the comb of a Cock, and on injecting the animal the membrane of the tooth was also injected.

Upon this mode of union depends the cure of the Hare-lip: from this arises the unnatural cohesion of fingers one to the other when the articulation has been destroyed by burns &c. from this arises the union of the chin to the breast when ulceration has preceded.

CCCLIX. But a variety of circumstances may prevent this mode of union taking place; the second process or that by adhesion inflammation is next excited; coagulated lymph being still the necessary

III. mode of union is supplied from the vessels of the side of the wound by the first or adhesive inflammation arising. This becomes organised & again fills up the breach.

CCCLXI. But many circumstances also impede the process, such as the death of the solid parts receiving the injury—hence their becoming foreign bodies, the too great violence of the inflammation (360) producing suppuration; the interposition of foreign bodies & and hence the process of restoration can not be accomplished without the third mode, (350 granulation).—

CCCLXII. When an internal cavity is exposed the whole of the cavity would run into inflammation unless some part of its surface is in contact with some other living part, that simple contact will set bounds to the spreading of the inflammation.

Hence when a cavity is exposed & the wound does not unite by the first or second mode of union the whole cavity still will often escape running into the suppuratory process, the contact of the edges or the part near the edges of the wound, with some of the containing parts setting bounds to the process of the new action.

The parts taking on Sympathy may however produce an exception to the rule in the text.

CCCLXIII. The adhesive inflammation is sometimes imperfect, not answering the final intentions. Other

is when the violence giving rise to it, has excited too rapid an action to admit of the adhesive process taking its full effect; this however seems rather to belong to the erysipelatous inflammation.

This is illustrated by dissections of women dying with the Puerperal Fever, where inflammation had produced adhesion between the Puerperal Uterus and some of the contained viscera, while the suppuration had generally diffused itself over other parts of the abdominal Cavity.

CCCLXIV. The cure of Inflammation (361.) is by resolution; but before we attempt the cure of inflammation artificially we must enquire into the constitution of the Patient, as whether he is disposed to irritability or indolence, his former habit, temper of mind &c. and also the situation & other circumstances of the part affected.

CCCLXV. The time for attempting the cure of inflammation is before the suppurative process has taken place.

CCCLXVI. We must consider whether the inflammation is of the true healthy kind or has the Erysipelatous disposition or any other specific disease mixed with it. We must also consider whether there is any increase of life or only an increased disposition to make use of life. — a distinction very necessary to be made.

113. CCCLXVII. We have noticed (332) that a change of colour in parts is produced by inflammations. When the inflammation is seated in parts near the skin & its actions violent, vesications will arise, the cuticle being separated from the cutis; this arises from the action producing death of the connecting medium between the cuticle & cutis.

CCCLXVIII. The coagulable Lymph (119) fulfils not only the intentions (293. 359. 360.) but also when the third mode of union, or as it takes place, becomes the basis of the future Granulations.

CCCLXIX. In the case, if the inflammation is of the ^{healthy} kind, we have only to remove whatever causes keep it up.

CCCLXX. An increased disposition to make use of life (366.) or too great violence of circulation is to be lessened by weakeners, evacuants, & the exciting of nausea, and by soothing remedies & anodyne medicines.

CCCLXXI. When there is both an increase of life & powers, and an increase of action weakening the system becomes necessary.

CCCLXXII. The system is weakened by bleeding if only increased action is present without increased powers. Bleeding is only to be had recourse to from particular indications &c.

a. — When it is desired to lessen the present action in order to give the disposition time to wear itself out without destroying parts by its violent action.

b. — When the part affected is a vital one.

c. — When it is near a vital part. —

CCCLXXIII. Unless the powers of action are greater the exigency of present circumstances requires that blood should be drawn from the system, topical blood-letting is to be preferred that from or as near to the inflamed part as possible.

Topical blood-letting however desirable cannot always be had recourse to: for instance in increased action of the vessels of any of the internal organs.

CCCLXXIV. Topical blood-letting should be particularly insisted upon where there is a disposition in the habit to form but little blood and when the part inflamed is distant from the source of circulation.

CCCLXXV. When the action only lost the powers are increased, it is to be desired that the constitution should perceive the loss of blood as little as possible. Topical bleedings give less alarm to the constitution than bleeding from the system.

CCCLXXVI. In our choice of bleeding we are in a great measure to be regulated by the pulse;

115. But as the pulse is differently affected by the inflammation of different parts we cannot be absolutely determined for or against bleeding by any one general state of the pulse; for the most part, however, it is to be considered - a quick & hard pulse generally indicates bleeding.

CCCLXXVII. Another general indication of blood-letting is the state of blood, but this can be only an after-proof.

CCCLXXVIII. If the state of the blood is visc. and the coagulum flat, and its texture loose; blood letting is contra-indicated, or at least to be sparingly employed.

CCCLXXVIII. Another general indication of bleeding is the wine, high in colour & small in quantity.

CCCLXXX. A comprehensive view of all the symptoms of health & weakness, present violence of action, the nature & situation of parts affected can only enable us to decide on the expediency of using or omitting bleeding.

CCCLXXXI. Purging weakens universally; it is to be had recourse to with the same caution as bleeding, and in vitiable habits still greater caution is necessary.

In weakened habits a single stool frequently produces fainting, nay it has even caused the abolition of the powers of life.

CCCLXXXII. Sudorifics may be proper when the constitution sympathizes much, because they do not so considerably diminish the strength.

CCCLXXXIII. Nauseating medicines lessen universally the powers of life; vomiting ones rouse the powers, for vomiting seems an action intended to relieve weakness. (383 note)

CCCLXXXIV. Soothing medicines. — Opium is the principle. Opium will only lessen actions not alter them. As the disease sometimes consists almost entirely in increased irritability by lessening the latter it may diminish the disease.

CCCLXXXV. We also endeavour to promote the intentions (370) by topical applications. As the preparations of Lead appear to lessen the power as well as lessen action. They are therefore not universally to be had recourse (366).

CCCLXXXVI. Cold powerfully weakens actions; from its use therefore great effects may be expected. The degree & length of applications of cold is however to be considered.

CCCLXXXVII. The effects of topical remedies will be either

- a. Immediate.
- b. by Repulsion.

c. - by Revulsion & derivation
d. by Sympathy. -

CCCLXXXVIII. The first order (a.) seems to require no explanation; applications acting by revulsion only produce their effect upon a part when the inflammation has arisen from ~~a~~ parts taking on the disease of the constitution, and the disease from a constitutional has become a local one; as Gout.

CCCLXXXIX. Revulsion & derivation are not well defined, the distinction between them is perhaps ideal; by them we must understand a cessation of action in one part produced by an increase of action in another part; this does not depend upon the humours, but a change in the place of action or irritation.

Upon this principle we use Phlebotomy to remove deep seated pains: upon the same we apply sinapisms to the Feet when the brain is affected: vomits when the testicle is inflamed.

CCCXC. Revulsion is cure of a part by ^{the consequences} ~~local sympathy~~ of the cure what they may.

CCCXCI. Sympathy. - The cure of a part by local sympathy is when the same effects arise in the part diseased from an application used to some other part, as if the application was made to the diseased part itself.

Hence it is that Mercurial Ointment applied to the

skin covering a node shall cause the node to disappear in the same manner as tho the mercury had been applied to the nose itself without the medium of the integuments.

CCCXCII. A cure of local inflammation by derivation or Sympathy will often take place when sedative applications have proved ineffectual.

Vomits curing inflammation of the testicle after Sedative. It had been used in vain; caustic behind the ear curing ophthalmia which had resisted all applications to the eyes. sluicade the tooth of the test.

The cure of the toothache by burning the ear is to be referred either to derivation or sympathy.

Derivation seems to be the reverse of sympathy. We cannot however always distinguish one effect from the other. The cure shall often be effected by sympathy; thus blistering one part will remove a pain existing in another part; tho the action excited by the blister may be of a different kind.

CCCXCIII. Topical applications may be divided into,

- a. - Fomentations,
- b. - Steam.
- c. - Lotions,
- d. - Poultices.

CCCXCIV. The order of (a & b.) are of short duration in their actions but may afford relief during

119. the applications: the order (c) are more lasting in their actions and are only substitutes for the order (d.) which of all applications produce the most permanent action.

CCCXCV. Poultices will be either

a. simple warm moist;

or

b. medicated.

CCCXCVI. The effects of a Poultice will be immediate on the parts to which it is applied; but by sympathy they will be extended further.

CCCXCVII. Medicated Poultices will be formed according to circumstances, with lead, Opium, Mercury &c

CCCXCVIII. When inflammation however excited exceeds the adhesive state, and gets beyond the point of resolution, suppuration is produced

Amongst the causes of this effect are wounds not united by either of the two first modes of union, and the third or granulation becoming necessary for their cure: violence having produced the death of parts to the removal of which suppuration becomes necessary: violence having exposed internal surfaces.

CCCXCIX. The cause of a parts running into suppuration is, its perceiving the stimulus of imperfection & being there necessitated to begin a new & unusual process.

1120.

CCCC. Communication with the atmospheric air is not necessary to suppuration.

The application of air to the internal surfaces, as the cavities of the Thorax, abdomen & Scrotum has been considered as the cause of suppuration, but this is not evidently the case; suppuration would take place in vacuo. In Emphysema where air is diffused all over the body, we have no such effect until an opening is made; but in case of suppuration from an opening the stimulus of imperfect takes place, the cavity being an imperfect one. To prevent this imperfection as much as possible we observe in a wound of the abdomen of a fowl that adhesion took place between some of the intestines & the edges of the wound; if this does not happen general suppuration succeeds. Another proof that air in internal cavities is not the cause of suppuration, is that in some animals the air has a free communication from the Lungs into the cells of their bones and into the abdominal cavity without producing suppuration, as is the case in many Birds.

CCCCI. Great violence of action is not necessary to suppuration; it is rather productive of gangrene. Suppuration is sometimes produced in a part without any visible violence of action in the part which takes it on.

CCCCII. Although it sometimes arises without any visible violence of action in a part yet in healthy constitutions it is generally found that the inflammation is considerable.

CCCCIII. The action producing it is most violent when it arises spontaneously.

CCCCIV. Suppuration takes place much more readily in internal canals than in internal cavities.

This we readily account for, knowing that suppuration is the first ordinary process in inflamed canals, whereas adhesive inflammation is the prior action in internal cavities.

CCCCV. It is not necessary to forward suppuration even in inflammations arising from the constitution, the constitutional disposition seeming to have produced its full action in the inflammation; or inflammation is to be considered as the disease taken on by the part from the constitution & so curing the latter, and suppuration is only the sequel of the disease.

CCCCVI. The adhesive inflammation going on to the suppurative, in the latter stage the general symptoms increase, the pain becomes more acute. The sensation arising from it is as much as possible that of simple pain; the redness is more intense, new vessels being formed, and old ones more dilated—hence a more

violent throbbing from an increased dilatation of the arteries. The swelling of the parts increased from a still greater effusion of coagulable lymph and serum. The surrounding parts become edematous.

✓ CCCCVII. One two or more parts lose the power of resolution and take on a similar state to cavities exposed: () a cavity is formed in which pus is secreted, at first mixed with coagulable lymph.

CCCCVIII. A return of adhesive inflammation checks the progress of suppuration.

CCCCIX. When the progress of suppuration is not stopped the matter will be carried onwards to the skin; the parts between the cavity & the surface of the body are gradually absorbed; the cavity becomes daily enlarged; the skin becomes thinner & thinner; at length ulceration from the pressure takes place & the abscess bursting a natural exit is given to the contained matter.

CCCCX. When the suppurative inflammation is going on vigors frequently occur, a common attendant on new actions of the constitution.

CCCCXI. When suppuration cannot be stopped the progress of the matter is to be carried as towards the skin, — hence the utility of stimulating plasters &c. Poultices can do little until the inflammation has invaded the skin, they then keep the surface moist and soft.

CCCCXII. Suppuration sometimes goes on without previous inflammation: here parts suddenly fall into it without allowing the previous action of ab-
 scessive inflammation, as in the dysipellatous
 suppuration: or it goes on slowly & without pain,
 as in some scrofulous cases.

CCCCXIII. When an healthy abscess is opened, the
 parts readily take on a disposition to heal, but in
 the collection of matter (412) when the abscess is
 opened & its cavity becomes exposed, a general inflam-
 mation takes place, and a perfect suppuration is
 formed, but the constitution is generally much af-
 fected by this process, for here the inflammation is
 to arise in a part already in the habit of disease.

CCCCXIV. The matter contained in the abscess formed
 without inflammation, will be different from that
 in the common inflammatory abscess; in the former
 it will be a curd like substance mixed with a
 thin purulent fluid.

CCCCXV. The fluid produced by the healthy suppura-
 tion is called pus, which is quickly & readily formed
 on the surface of canals

CCCCXVI. In the formation of pus a particular
 organization of parts seems necessary tho' we do
 not exactly know in what the nature of that or-
 ganization consists, any more than we do that
 which is necessary for the different secretions.

CCCCXVII. Pus is to be considered as a secretion and the parts secreting it to be glandular. Does not arise from a destruction or dissolution of the solids by fermentation &c. the solid parts may die slow & be found in it; nor with a mere staining of matter from the blood.

CCCCXVIII. Pus is a fluid which in its perfect state has certain peculiar qualities as colour & consistence; it is somewhat sweet & manly to the taste; it consists of a number of large whitish globules swimming in a fluid resembling serum of which globules it will have a greater or lesser proportion according to the Health of the body that produces it. Like serum the fluid Pus is coagulable by heat.

CCCCXIX. Pus perfectly mild & inoffensive in its natural state, incapable of irritating the most sensible skin.

CCCCXX. Pus when absorbed into the habit and mixed with the blood is productive of no ill effects, unless it is the vehicle of specific poison.

CCCCXXI. Pus is less disposed to putrify than other animal fluids: when in certain situations and in contact with air, it readily takes on putrefaction, and becomes offensive: but this is probably from other substances as blood &c. being mixed with it.

CCCCXXII. When an abscess is first opened, portions of coagulable lymph mixed with pus are commonly

found: these are part of the lymph which had been employed in making the cyst containing the matter, becoming loosened from the internal surface of the abscess & being blended with pus.

CCCCXXIII. Chemical experiments cannot explain the nature or manner of the formation of Pus.

Pus cannot be formed from the melting down or waste of the solids, otherwise how could the human penis in the virulent Gonorrhoea furnish pus many times exceeding in quantity the substance of that organ. Some have denied the discharge from the urethra, and ^{other} ~~other~~ canals known to be purulent, and affirmed that it was only mucus; but it has every characteristic of pus. No injury arises from the absorption of pus into the circulation, otherwise how must those fare who have large sores, as patients undergoing amputation whose health is often undisturbed thro' the whole of their cure. Pus may become offensive by being mixed with other fluids, as putridified blood &c. hence its odor when its discharge attends a diseased bone.

Pus is a bland unirritating fluid, for we see it make its way in Psoas & Hip Cases, from the loins & hip low down into the thigh without producing the least sense of pain, unless merely from its weight & distention of the parts amongst which it is seated. — Pus cannot change animal solids into its own nature by any fermenting process: Chemistry cannot imitate the process of nature in forming pus in the animal

body any more, than any other of the secretions: nor can chemistry decide on the nature of pus. The conclusions drawn from the precipitation of it from Nitric Acid &c are irrational & unsatisfactory: the precipitate from any other animal substance so disposed will give equally the same appearances. -

CCCCXXIV. The formation of Pus is to be considered the a new, yet as a process of Health. Parts taking on a diseased action, the secretion of pus is interrupted, and it is no longer generated pure & possessed of its peculiar properties.

CCCCXXV. Pus like all other fluids thrown off from solid parts will always partake of the nature & properties of the parts from which it is secreted, & accordingly will have the occasionally specific property of the Lues, the Cancer, the Small-pox &c.

CCCCXXVI. The final use of Pus, or intention of nature in producing it is not known.

Pus may be of use to serve to keep them moist & but this does not explain why it is formed in internal cavities. It may also be useful as a vehicle in the removal of extraneous substances, this however can be only a secondary intention, with its final use we are still unacquainted. -

CCCCXXVII. Ulcerative inflammation is that action into which a part falls from a disposition to absorb itself, even to the solution of Continuity. -

12/ CCCCXXVIII. The cause of this ulcerative absorption will be inability of parts to support themselves under present circumstances; these circumstances will be
a. Irritation
b. Weakness.

CCCCXXIX. These circumstances give rise to
1st A consciousness in the parts of the necessity to be absorbed.
2^d A consciousness in the absorbents of the necessity of commencing the absorbing process.

CCCCXXX. Irritation will be given by
a. Pressure
b. Contact with dead or foreign matter.

CCCCXXXI. Weakness, or want of power in parts to carry on their natural functions may be a cause of the ulcerative absorption.

CCCCXXXII. Pressure considered as irritating is of two kinds

- a. Pressure from the surface inwards
- b. Pressure from within outwards. Tension

CCCCXXXIII. Parts strongly resist the action of pressure
a. but readily yield to the action of pressure. b. (432)

CCCCXXXIV. From the above then we infer that when the irritation of pressure. a. (432) is applied to produce ulcerative absorption, it must be very violent in proportion to the strength of the parts, for it is not sufficient to destroy the power of resistance in the parts pressed, it only produces a thickening of them.

CCCCXXXV. Nature resisting the entrance of foreign matter into the body, thickens & thus as it were strengthens the parts to give them a greater power of resisting the admission of what would prove pernicious to them.

CCCCXXXVI. In pressure from within outwards, (432) the internal parts as cellular membrane &c fall more readily into the ulcerative absorption than the skin: in irritation from external pressure and from contact with foreign matter the skin falls more freely into it than the other substances.

When a collection of pus makes its way to the skin we find the cellular substance, adipose membrane &c even muscles to a considerable extent ulcerated, whilst the skin ulcerates only so as to form a small hole for the exit of the matter.

CCCCXXXVII. When the pressure is from within outwards the all sides are equally in contact with & compressed by the body making the pressure, yet that side only will accept of ulceration which is nearest the surface of the body.

If inflammation attack the external coat of an intestine adhesions are produced between it and the peritoneum, and if the inflammatory action goes on, an abscess is formed in the middle of the adhesions after which the matter contained acts as an extraneous body. Ulceration takes place only on the side next the skin between which and the matter, (even in the most corpulent persons) the

129 muscles, partly membrane & cellular substance will be eliminated before so than an interior substance as the intestine will fall into ulceration (Edwards gives several cases of this kind but does not explain them.)

CCCCXXXVIII. When bodies making pressure on within outwards are to be carried to the surface, in the natural process the adhesive inflammation of the neighbouring parts precedes the ulceration of the skin, for nature finding exposure must take place by the former process, provides against that inconvenience and renders its extent as small as possible.

CCCCXXXIX. When absorption is to take place of the parts between a surface lodged within, and the surface, in order to the removal of that substance there is always a mixture of the ulcerative & intersticial absorption.

When living tumours are brought to the skin, within progress the intersticial absorption only goes on, until there arises a necessity for the ulceration on the skin, many other substances are also brought to the skin without producing the ulcerative absorption.

CCCCXL. Ulcerative absorption goes on either with or without suppuration.

Suppuration very commonly, and in some parts always attends on the ulcerative absorption: of this we have abundant instances in the muscles,

cellular substance & skin: we have also instances of its proceeding without producing pus in bones, when sustaining the pressure of aneurisms &c, in the absorption of the alveolar processes after removing a tooth, and in the removal of Callous after fractures. In Dr Anson's voyage we find that several of his Crew who had been sorely afflicted with the scurvy, which occasioned the spontaneous dissolution of old creatrices and even of the callous formed after the fractures.

CCCCXLJ. Bones as well as soft parts become open to ~~absorptive~~ absorption from pressure and irritation, but the cuticle is incapable of irritation & of the ulcerative absorption.

CCCCXLII. An exception to (437) will arise when the irritation from the pressure is violent and the adhesive inflammation has not duly taken place in the parts behind, within, or on one side of the irritating substance.

Hence it is that matter sometimes bursts into the air cells of the lungs, when suppuratory inflammation of the pleura & lungs had happened, instead of making its way thro' the intercostal muscles to the skin. For the same reason pus sometimes in abscesses of the liver makes its way internally, bursting into the internal tube or the abdominal cavity.

CCCCXLIII. The difficulty with which the cuticle

131 (441) is removed for the expulsion of matter is the cause of pain in suppurations where the cuticle is very thick, as in Whitlow, abscess in the sole of the foot.

CCCCXLIV. The ulcerative absorption but little affects the constitution, altho the constitution has powerful effects in the ulcerative absorption. A change in the constitution will often occasion a sore to spread more in one night, than we can procure in a fortnight. —

CCCCXLV. An ulceration consists in the division of parts naturally united, or in a particular mode of solution of continuity, so its cure is effected by a reunion of them either by adhesion (358) or by granulation. The third mode of union (358. c.). When the 1st & 2nd modes of union will not take place in parts violently separated, the third mode is pursued in the process of restitution. This is by means of granulation.

CCCCXLVI. Granulations are formed by coagulable Lymph effused, from the surface of the ulcer becoming vascular. Vessels from the original parts pass to the basis and also to the surface of the granulations and would always seem to terminate there.

CCCCXLVII. Granulations are always of the same nature as the parts they arise from.

CCCCXLVIII. Granulations will be healthy or unhealthy. The more convex they are seen, the

smaller their points, and the more fluid the colour they are of, the more healthy: the flatter their surface, the paler or the more they approach to a blue, the less well they be found healthy, and the more slowly will they admit of the parts being healed.

By attending to the appearance of a sore we may judge whether it is healing or disposed to ulcerate further. If the latter the edges will be irregular, inverted, or hanging over the ulcerated surface: the discharge in general thin: the surface in the whole or in many parts concave: whereas when there is a disposition to healing, they are convex, the margin purple, covered with a whitish semitransparent membrane.

CCCCXLIX. By the appearance of granulation we may judge in some measure of the state of the constitution.

In the vitiable constitutions the granulations will mostly loose & flabby.

CCCCI. When granulations are healthy they have a strong disposition to unite one with another.

Mr Hunter saw two granulations, one from the scalp the other from the dura mater arising after trepanning, united so firmly together, that they could not be separated without an hæmorrhage.

CCCCII. Granulations are in general the consequence of suppuration; but granulations may sometimes

133. take place without suppuration preceding.

A man, aged 50, broke his thigh and the attempt of a reunion both by the first & second mode failed: for the fracture, which was simple, did not unite after being bound up for a considerable time; at length the man died: upon examination it was found that granulation upon the ends of the fractured bones though without suppuration had taken place.

Trifling & slight wounds on the skin though they unite by the first intention do not always require suppuration: they heal frequently under a scab. -

CCCCI. To perfect the cure of an ulcer it is necessary that the granulations receive a covering, or that the process of cicatrization takes place.

CCCCII. Cicatrization is performed partly by the elongation of the original skin, & partly by the formation of a new skin.

CCCCIII. The original skin is recapitulated to elongate or stretch itself by the contraction of the granulations.

CCCCIV. Cicatrization is always in view when granulations are formed: when the granulations have been carried to a sufficient degree, the contraction of the granulation begins at every point as the contracting process goes on the skin on all sides is drawn nearer the centre of the sore.

CCCCLV. When the contraction of the granulations has been carried so far as circumstances will admit of and the consequent elongation of the skin has been carried to its greatest point from the margin of the original skin the new skin shoots.

When the contraction of granulations perhaps goes on in some degree till the cure is completed, but after a certain time they contract not sufficiently to oblige the skin to stretch itself, and hence there must be a necessity for the formation of new integuments.

When the original skin is unfit or cannot give the disposition for the new one to form, then there is a disposition sometimes in the centre of the sore to produce it, — hence it is we sometimes see sores begin to cicatrize in the middle.

CCCCLVII. The contractions of the granulations, or their effect in elongating the original skin is impeded by being seated on hard parts, as bones: and where the sore is circular instead of having considerable length in proportion to its breadth.

We see that if the wound or ulcer takes place on soft parts as the buttocks, &c. where the skin is loose, the quantity of new skin formed in the healing is very little, but in ulcers on hard parts as on the head, the skin is enabled to stretch but little: — hence in wounds of the scalp, the new formed skin

is nearly of equal extent to that of the lost substance
 CCCCIVIII. The formation of new skin is a process nature performs with difficulty, and with more difficulty in the lower extremities than in other parts of the body.

Hence it is evident that Surgeons cannot be too cautious in saving skin, when it becomes necessary for them to remove parts as in amputation of the Leg &c and especially where the wound is to the inflicted on bone the natural covering of which is little besides the skin, as on the Tibia &c.

CCCCIX The new skin is a very different substance from the old: whether it consists of the granulations altered in their structure, or is a new and distinct substance from them is not to be ascertained. It is less moveable than the original skin appears to be upon the stretch as if a small piece of skin was stretched and sewn into a larger hole, so that the sides of the old skin seem puckered. It gradually however is subjected to mechanical motion, and becomes more loose and flexible. The young cutis when first formed is very full of papels but these are either afterwards taken away or changed into absorbents until the part at length becomes quite white.

From ~~that~~ of this aphorism it must be evident of how much utility motion & friction must be to a part stiffened, from having undergone gra-

136 mulation & cicatrization. Mercurial unction & Electricity, both conduce to this end & seem very properly indicated.

CCCCIX. Whenever a new Cutis is formed a cuticle is found also, the Cutis forming it more readily than the granulations from Cutis. Every point of cutis is forming cuticle.

CCCCX. The Rete-mucosum is always late in forming cicatrices between the cuticle & Cutis. Sometimes it is not formed at all.

As in negroes who when they are burned or lacerated the cicatrix formed after healing wants the black tint.

"But even in negroes the rete-mucosum is formed. I have found on examining the cicatrix of a negro adult from which by maceration I turned off the cuticle & found the rete-mucosum perfect."

CCCCXI. The cicatrization is sometimes materially affected during the going on of the processes of restoration above described, by certain actions.

CCCCXII. The most ordinary actions from (52) are,
a. Hectic
b. the action of dissolution
c. Spasms.

CCCCXIII. Hectic is a remote constitutional sympathetic affection, taking place in a constitution

137 weakened by a long continued local disease, which it neither can get rid of nor cure.

CCCCCLXV. It will be caused by affection of vital or non-vital parts.

CCCCCLXVI. It is produced earlier by the affections of vital, than of non-vital parts.

CCCCCLXVII. In the non-vital parts it most frequently arises from affections of those parts which have a backwardness to and a small power of healing (275. 276. 277).

Thus we see affections of the ligamentous parts more readily bring on hectic than muscular parts. Diseases of joints very frequently produce this constitutional sympathy; and the larger the joint the earlier this effect will take place. An affection of the knee or elbow brings on hectic speedier than a disease of the wrist or ankle: again, the backwardness of parts to heal depends much on their situation in the body. (277.)

In the lower extremities the power of healing will be less than in the upper, and we see a disease of the knee or hip produce hectic sooner than a disease of the elbow or shoulder joint.

Hectic will arise from affections of parts whose natural powers of healing are not weak; as in large abscesses in the muscular parts, but it still depends upon the same principle, a disease which the constitution can neither conquer nor get rid of. (464.)

CCCCCLXVIII. The more extensive the seat of diseased action in parts of equal powers of healing, the earlier will the hectic be induced in the constitution.

CCCCCLXIX. Hectic does not arise from the absorption of purulent matter into the system.

It will arise in vital parts & joints even before suppuration has taken place. Did it arise from the absorption of pus it should take place in one large ulcer as well as another, for it does not appear that there is a greater disposition for absorption in one ulcerated surface than another. It should arise from several limbs where the matter is often very poisonous.

In large abscesses the hectic disposition comes on after opening when matter has been discharged. If the constitution can heal up these abscesses no hectic arises: large suppurations have taken place, the matter absorbed again without opening, yet without the rise of hectic. We readily conceive why it should take place sooner in vital than in non-vital parts because the former gives the alarm sooner to the constitution. (221 note) Hectic commonly arises from lumbar or Psoas abscesses, suppurated joints, white swellings &c.

CCCCCLXX. Hectic then depends upon a part being irritated beyond its powers of acting for restraint: and beyond the power of the constitution to overcome

the disease.

Whatever then will long and obstinately seize the constitution may become the cause of hectic. CCCCLXXI. It is however sometimes doubtful whether the hectic is not an original disease of the constitution: we see it arises when there is a sore in a part which has no impediment to healing. Here the hectic must be cured before the sore will heal.

CCCCLXXII. Hectic is a kind of slow diminution of animal life, even to gradual dissolution: its symptoms are in general slow fever with great debility, languor, want of appetite, paleness of the skin, sweats easily procured & indeed arising spontaneously: frequent sickness & vomitings, and habitual purging, & clear urine.

CCCCLXXIII. The administration of internal medicine can only be useful in order to cure the hectic by somewhat strengthening the constitution & enabling it to support its struggle longer than it could do unaided.

CCCCLXXIV. Its cure can only be effected by the removal of the local disease either by taking away the part or by inducing in it a disposition to heal.

CCCCLXXV. The constitutions most disposed to hectic, are the weak & irritable.

CCCCLXXVI. The action of dissolution is different from hectic when the constitution seems to have every thing in its power; having gone thro and supported the

process of inflammation & suppuration its powers will suddenly sink and the destruction of animal life be readily accomplished.

The action of dissolution seems different from hectic:— it is infinitely more rapid in its progress: it is incidental to opposite constitutions; it is incurable by the removal of any part, & therefore seems to be an act of the constitution.

CCCCLXXVII. The symptoms are universal affection of the stomach, shivering, nausea, frequent vomitings, small quick pulse, hæmorrhage from the surface of the ulcer; excessive spontaneous sweatings, soon succeeded by death!

CCCCLXXVIII. The habits most disposed to it are the robust & full.

CCCCLXXIX. For its cure nothing seems to be effectual.

CCCCLXXX. Muscles lose their power of action not only when the nerves leading to them or which are their immediate instruments of motion, are compressed or destroyed, but also when there is no longer a necessity for or propriety in their acting (53) and hence they become the naturally involuntary instrument to the will.

CCCCLXXXI. They also become open to interstitial absorption and waste in size or firmness.

If a limb has its bone or bones fractured the muscles will no longer act in obedience to the will.

141

The same is the case when a joint is undered up. If the patella is fractured the patient cannot voluntarily act with the rectus muscle.

It is extremely curious to observe that voluntary muscles, when the final use of their being no longer exists, become no longer the instruments of the will: and that they then waste in bulk, strength and firmness become soft & flabby.

End

of
Part

the First.

Rationale,

Rationale of Surgery.

Part the Second.

Illustration of the Doctrines contained in Part the First.

CCCCLXXXII. In the circumscribed cavities when taking on inflammation, the adhesion it is observed () is the first to take place: if the progress of the complaint is not checked or put a stop to by the adhesions, the suppurative or the ulcerative stages are the necessary sequels. ()

CCCCLXXXIII. In cavities containing vital parts, the ulcerative stage is seldom produced for before the complaint proceeds thus far it generally kills: to produce adhesions between contained & containing parts it is not necessary that the surfaces of both should be inflamed.

CCCCLXXXIV. According to the degree or extent of ^{in a circumscribed} cavity will be greater or less: if suppurative the adhesions the suppuration comes on in a cavity where no adhesions have taken place, the whole surface of the cavity will become the seat of suppuration.

CCCCLXXXV. The contents of an inflamed cavity will

163. not always partake of the inflammation of the containing parts, for the Lungs or the Intestines may remain uninflamed, tho a Pleuritis or Peritonitis may be present.
CCCLXXXVI. The preceding Doctrines will be illustrated by observations on the inflammation of the following cavities.

- 1st The Thoracic Cavity, or inflammation of the Pleura.
- 2^d Inflammation of the Pericardium.
- 3^d ----- Peritoneum, as containing the abdominal viscera.
- 4th ----- of the Bladder.
- 5th ----- of the joints Sacculi mucos.
- 6th ----- of the Eye.
- 7th ----- of Veins.
- 8th ----- of the Encephalon.
- 9th ----- of the Tunica Vaginalis.

also by injuries & diseases of bones: by wounds in soft parts: Lastly by common & specific diseases of the constitution & parts.

CCCLXXXVII. The Pleura is more subject to inflammation than any other membrane lining a cavity in the body, not from its particular nature but from particular circumstances, as being much exposed to the action of Cold &c.

CCCLXXXVIII. The pleura becoming inflamed adhesions are formed between that membrane and the lungs, sometimes

with but little if any pain. Sometimes the adhesion is throughout the whole of their surfaces; sometimes in parts only: these adhesions frequently terminate the complaint.

CCCCXXXIX. But it frequently happens that

the inflammatory action goes on to suppuration: if the whole cavity becomes the seat of it, then the true ^{Empy-}sema takes place: if the suppuration is by means of the adhesions confined to certain parts, then the Spurious Empysema, or collection of matter not communicating with the general cavity of the Thorax is produced.

CCCCXC. The Empysema will be preceded by violent pains in the Thorax, difficult respiration, quick pulse, rigors &c.

CCCCXCI. The Empysema when present will have symptoms peculiar to itself together with the common symptoms; and symptoms from sympathy of a fluid contained in the cavity of the Thorax.

CCCCXCII. The common symptoms of a fluid extravasated in the chest are, Difficulty, frequency of respiration.

Breathing easiest in some particular situations.

If the fluid be in one lateral cavity only, the Patient lies chiefly & most easily on the affected side: if in both cavities then he will only lie on his back, and that not horizontally. The head & chest will

145. he elevated, otherwise he feels a sense of impending suffocation: there is a sense of weight in the diaphragm. Some patients can perceive the fluctuation within them. Frequently, Anasarca, & Ascites, sometimes, are present.

CCCCXCIII. The peculiar symptoms of the true Emphysema are a great difficulty, uneasiness in expanding the chest: great lowness & depression of spirits: frequent sense of seeming impending dissolution: the fluid accumulating gradually.

CCCCXCIV. The Sympathetic symptoms are, great irregularity of the pulse, palpitation of the heart &c.

CCCCXCV. Water may be extravasated in the cavity of the Thorax, and the disease then becomes a dropsy of the chest: to the common symptoms (492) & the sympathetic (494) may be added that circumstance, the fluid is suddenly collected.

CCCCXCVI. Air may be extravasated in the cavity of the Thorax by a wound in the lungs from the end of a fractured rib: here the pleura being also wounded the air will escape into the cellular membrane & produce a partial or general Emphysema.

Emphysema will often remain a considerable time. Internal parts do not fall so readily into the adhesive inflammation as the more external parts: hence the wound continues open so long and

admits the escape of the air.

"I believe the presence of pus or water extravasated in the thoracic cavity, will be alone accompanied by the anasarcaous symptoms; blood or air not producing their appearances."

CCCCXCVII. Blood may be extravasated in the cavity of the thorax and will occasion the common probably several of the other symptoms.

CCCCXCVIII. For the discharge of extravasated fluid from the thoracic cavity, the operation for the Empysemata or the paracentesis of the Chest becomes necessary.

CCCCXCIX. This should be performed as early as possible because its sequel (as being exposing of & rendering the thoracic cavity imperfect) is an universal suppuration generally ending in Death.

When pus is present in the cavity of the thorax, no objection to the operation can arise for the part is already in a state of suppuration.

D. When Empysemata (496) in consequence of a wounded lung arises and extends to a considerable degree, the cellular membrane may be scarified to discharge the offending air.

DI. The scarification should be made at some distance from the seat of the fracture of the rib.

DII. The lung on the opposite side (if only one be wounded) should not have its action confined, nor should the

147. escape of the air from the cavity of the thorax into the cellular substance, be impeded.

If you make the incision upon or near the fractured rib with respect to the bone you place it in a state of compound fracture and may induce all its ill consequences, besides rendering the chest and exposed cavity. The sequel of a compound fracture will be hereafter shown.

DIJ. In the case before us tight bandages applied to the thorax & compressing the parts which receive the injury is improper.

This must be obvious from considering the text (502); the scarifications 501 need not be more than half an inch long, but sufficiently deep to make exposure of the cavities of the cellular substance: when which blood is extravasated (eggs) the paracentesis of the thorax must be generally necessary from the great danger of suffocation that must attend its continuance in the cavity.

Mr Hunter has sometimes seen patients recover from injuries of the thorax even when suppuration had taken place (as after gunshot wounds) he finds it difficult to account for the means of recovery, but thinks it must be by a kind of resolution, for the lungs in exposure of the cavity of the chest are generally collapsed so that adhesions between this membrane (and the lungs in those cases cannot be effected.

DIV. It will be difficult to distinguish the inflammation Suppuration of the pericardium, from that of the Pleura, or the Thoracic lateral Cavities: the Heart sympathizes with affections of the latter, and the latter with those of the Pericardium.

DV. If adhesions take place between the Heart and pericardium, the patient generally recovers: if the inflammation goes on to suppuration the patient always is destroyed. -

DVI. The adhesion of the Pericardium to the heart is attended with palpitations of the Heart, irregularity of the Pulse, frequent, difficult Oppressive Breathing, pain in the sternum, frequent syncope, debility.

To such symptoms the name of "Angina Pectoris" is given.

DVII. The Peritoneum is the largest investing membrane in the body: it is subject both to Spontaneous inflammation, & to inflammation from external causes.

By spontaneous inflammation is signified an inflammation arising without any visible cause.

DVIII. The Peritoneum taking on inflammation runs through its actions sooner than any membrane or cavity in the body.

DIX. The inflammation may be either common or septic (313): at the onset it is difficult to determine its nature. -

149. DX. Whether it is of the common or erysipelatous kind it will at first be accompanied with a violence of action of the constitution which is powerfully roused. But of the Erysipelatous kind the strength of the patient will soon sink.

DXI. The peculiar symptoms will be again in the abdomen, not of the colicky or spasmodic kind, but a sense of soreness of the abdominal regions, greatly increased by pressure or by stretching the peritoneum.

DXII. The intestines will also from sympathy take on an unnatural action: costiveness in some cases, in others a diarrhoea will be induced.

DXIII. The inflammation if it does not go off by resolution, or unless adhesions taking place prove obdurate, it will produce suppuration.

DXIV. The suppuration will be

a. Partial, if adhesions, taking place, limit the extent of it.

b. Universal, if the adhesive inflammation is insufficient, either in its time of duration or degree, to produce adhesions of the membrane to its contained parts.

DXV. If the suppuration is universal, it always destroys the patient; the prevention of this state is therefore to be diligently attended to.

DXVI. Bleeding seems the only means we have of preventing suppuration and therefore should be had recourse to: it should seem to be improper in the Erysipelatous

species, but even there we know of no other means of warding off suppuration.

DXV]. When universal suppuration of the cavity happens, trial might be made of opening the cavity with a trocar, evacuating the fluid as much as can be, (and washing the part well by injecting warm water.

DXV]. When the suppuration is partial (a 513. 682. 362) the matter frequently points outwardly, like any other abscess, either ulceration takes place & it breaks, or it is opened and the patient does well: here is a striking proof of the ability of the adhesive inflammation.

DXVI]. The lying-in, or puerperal fever, is a sympathy of the Louthition with an inflammation of the peritonum.

DXV]. The Cause of the puerperal inflammation of the peritonum arises as well as every other inflammation of this part from a stimulus of impression which in this case is given by the uterus.

The uterus on dissection is generally found sound & free from inflammation; the disease then does not arise from inflammation of the uterus, but the uterus conscious of some change effected in its nature, will give the same stimulus to the peritoneal cavity, as would arise were the uterus removed, and thus the abdomen be made an imperfect cavity. Parts may retain their life and yet give a stimulus productive of death to other parts.

" This seems to be the action of the sympathizer

157 becoming more violent than that of the sympathent.
The dissection of Women dying of this disease
proves in general the fatal termination to be a suppuration
of the Peritoneal cavity.

DXXI. Sometimes after lying-in, the adhesive inflammation
will prevent the suppuration from extending itself far, and
an abscess will form at the lower part of the belly, and
do well.

NB- here supposes the broad round ligaments of the
womb most affected.

DXXII. The peritoneal suppuration will sometimes
succeed tapping, or the Common Operation of the Ancients
of the abdomen.

This most commonly takes place ⁱⁿ ~~in~~ patients with
unbound viscera & peritoneum, and in whom the disease
has been of long standing; rarely the first time tapping,
but not uncommonly the third or fourth. Mr Hunter
has seen on the second day after tapping the inflammation
spread over the whole cavity of the abdomen, yet pro-
ceed no further, in which case it does not kill. Hence
we should be cautious of our prognosis of the event
of tapping.

In dissecting patients who have died after tap-
ping, the same morbid appearances have occurred to the
examiner, as in Women dying of puerperal fever. The
symptoms have been the same during their illness. -
Mr Hunter mentioned the cases of two men, who died

152. after tapping the appearances on examination after death.

DXXIII. From what has been said it must appear, that whatever can produce in the peritoneal cavity the stimulus of imperfection, whether the death of one of its contained parts, an uncommon action of one of its contained parts, external violence, or penetrating wounds not healing by the first intention, or by adhesion formed near the opening between the membrane & some vessels, may occasion the peritoneal inflammation.

DXXIV. The operation for the Bubonocoele & Femoral Hernia, the Caesarian Operation, may all be productive of the peritoneal suppuration, because they all occasion an exposure of the cavity, to which suppuration must succeed, if the exposure continues long enough to take the alarm.

The suppuration of the peritoneum after the operation for the bubonocoele and femoral Hernia do not happen, because the sides of the sac are brought together and closed before the alarm is given to the cavity. In the Umbilical Hernia after the operation the external parts do not adhere, but the union must be performed by suppuration and granulation.

Thus the omentum should be made the basis of the granulation, that uniting with the external parts it may prevent the general inflammation of the abdominal cavity.

DXXV. After the Caesarian operation and other cases

153. of wounds into the Abdomen. care should be taken to bring the lips of the wound in contact; but not to pass ligatures or sutures are used so deep as to penetrate the peritoneum.

A. B. a crooked woman was with child, and went her full time: her pelvis was so narrow & deformed that she could not have been delivered by the Forceps. Mr Hunter delivered her of a living child by the Cesarean Section: immediately on its contents being removed, the uterus contracted strongly, the Lips of the wound were brought together by the uninterrupted Suture: the woman died soon after & on dissection the small intestines were found adhering about the wound; the uterus was very much contracted: there was a quantity of extravasated blood like wise in the abdomen: it would seem from this latter circumstance that in similar cases the wound should not be closed until the bleeding ceases.

DXXVI. The internal coat of the bladder is liable to sup-
puration on exposure; the not very susceptible of it.

Of this we abundant evidence in observing what happens during the cure of patients who have undergone Lithotomy.

DXXVII. The Doctrines (482.. 483) are further illustrated by the common consequences of the exposure of Cavities of Joints by penetrating wounds, which if they heal not by the first mode of union () a general suppuration takes place, for here there being no container

shells as in the abdominal & thoracic cavities when adhesions forming might prevent the general action of suppuration, an universal suppuration of the cavity must be the event.

DXXVIII. Joints becoming diseased have a great backwardness in recovering health (275-277) hence when suppuration has taken place and the third mode of union () becomes necessary, granulation goes on with difficulty & slowness, - hence also agreeable to what is observed (427) we are enabled to understand why hectic is no unusual consequence of joints falling into suppuration.

Joints as consisting of ligamentous & membranous parts have their processes carried on slowly: we see the worst consequences follow suppuration of the joints, the loss of limbs and even the life of the patient is no unusual sequel. If a cure is effected it is by granulation and the granulations afterwards for the most part become bony, and thus the joint is under motion: less.

DXXIX. Granulations forming, though they effect a cure, alter the structure of the part: hence its utility as a joint is lost: motion is destroyed: an Ankylosis takes place.

DXXX. Hence it is evident that Surgeons when they intentionally cut into a joint for the purpose of removing an extraneous body as a loose bone, or

155 cartilage, or for evacuating a fluid, as in dropsy of a joint, should always be extremely attentive to procuring union by the first mode, and of avoiding every circumstance that can tend to interrupt it.

Therefore sutures penetrating the cavity of Joints should be avoided.

DXXXI. The *Sacculi mucosi* are similar in their nature & use to joints, and contain a fluid to facilitate motion: the consequences of injuries done to them, will be similar to those inflicted on the Cavities of Joints.

DXXXII. They are subject to dropsy, and when affected with it are to be cured by obliterating their cavity, this is generally followed by a weakness and stiffness of the parts to which they belong, but this is soon relieved by giving them motion.

The *Sacculi Mucosi* are found between bone and Tendon - between Cartilage & Tendon - between Bone & Skin - or between Ligament and skin; also between the patella & skin - the olecranon & skin, the annular ligaments of the fingers & skin. &c. &c. (532). Obliterating their cavity &c is done by closing them, preventing the lips of the wound uniting by the first intention, & so making suppuration & granulation necessary. On the same principle is the dropsy of these parts to be cured, as that of the *Tunica vaginalis* or *Hydrocele*, which will hereafter be explained.

DXXXIII. The chambers of the eye are subject to the suppurative inflammation, which may have its

seat in one chamber as the anterior only. -

DXXXIV. The causes of this may be whatever can give the stimulus of imperfection to the cavity, whether spontaneous inflammation not terminating by resolution, or a wound not healing by the first mode of union - hence it may follow the extraction of the Cataract &c.

DXXXV. By inflammation of the Chambers of the eye, the Iris may be made to adhere to the Crystalline Lens. -

DXXXVI. The formation of pus in the anterior Chamber of the Eye will obstruct the passage of the rays of light, similar to an opacity of the Cornea.

DXXXVII. It will produce an appearance of an opaque Cornea with which indeed it may be complicated, or it may be single, no opacity of the Cornea being present.

DXXXVIII. When single it may be distinguished from an opacity of the Cornea, by the pus forming in the anterior Chamber, a section of a circle, a straight line forming its superior side. As the accumulation of the pus increases, its figure approaches nearer and nearer to a perfect circle, till at length it entirely covers the pupil; however when fully confirmed it is not to be ascertained whether it is complicated with an opacity of the Cornea or not. -

DXXXIX. In general of the disease is of long standing the Cornea is opaque.

DXL. The removal of the pus is obtained
 a. - by absorption into the system.
 b. - by ulceration of the cornea evacuating it;
 c. - by an artificial opening. -

DXLI. (A. 540) is the most desirable mode of cure, as if the cornea is not opaque, vision is readily restored.

B. is the worst mode of all, being invariably followed by blindness from the cavity becoming obliterated (as in other abscesses) from the injury it may do to the crystalline lens and from the shrinking or wasting of the eye; therefore

C. is to be preferred, tho' even from this mode, small hopes of restoring vision can be entertained.

A Gentleman had an inflammation of the scleroticæ, but the cornea remained clear; he had darting pains in the back part of his head, with lassitude &c. A white speck appeared on the cornea which being a collection of pus gradually increased till at length the suppuration filled the whole anterior chamber, and the matter was let out by an incision similar to that for the cataract. On the 5th day the eye appeared flat: the Iris & pupil could hardly be seen. - 6th day the cornea was rendered full by a thinner & more transparent fluid. -

158
5th day. Matter was visible at the bottom of the wound.
in the end his eye was lost as to vision & diminished
in size.

DXLII. The Venu are not to be considered as canals.
but as cavities. Like other cavities the internal Coat is
liable to the adhesion, as well as the suppurative & al-
terative inflammation.

DXLIII. The Causes of the inflammation of Venu will
be the same as those of inflammations of other Cavities.
Whatever can produce the stimulus of infection in
them will bring on inflammation.

The internal Coat of a Venu may inflame from a
puncture made in bleeding, should it not heal by the
first intention. Therefore in bleeding the Surgeon should
always be careful that his Lancet is very sharp, and
that after stopping the blood, he well closes the orifice.
When the arm bleeds a second time after Venesection
from the same orifice not healing a second time without
inflammation Linen or lint is a better application
after bleeding than sticking plaster for obvious reasons.
There are more sore arms after bleeding where sticking
plaster is used, than where lint. Sore arms
after bleeding have been commonly attributed to
a nerve, but Mr Hunter thinks they more commonly
arise from an inflammation attacking the internal
coat of the Venu, for if when horses are bled the
farrier is not careful to produce union between

the edges of the wound, a suppuration not infrequently attacks the internal surface of the vein, & if it extends (as it frequently does) to the heart, the animal. Adhesion, suppuration, and ulceration may all be going on in a vein at the same time, as Mr Hunter found on examining the body of a man in St George's Hospital, who died after bleeding.

We sometimes observe a chain of Abscesses in the course of the veins after bleeding in the Saphena. When suppuration takes place a compress on the vein, above the seat of the suppuration is best both to produce contact between the sides of the vessel, and obliterating its cavity & thus preventing the blood from carrying pus onward towards the Heart.

DXLIV. If the adhesive inflammation takes place in any part of a vein its cavity is obliterated & a cure is performed.

DXLV Suppuration arising, if by means of adhesions taking place above the point of suppuration, a simple abscess will be formed, and no ill arise. (but 546.)

DXLVI. The inflammation & consequent suppuration may extend (in default of the adhesive inflammation setting bounds to it) throughout the whole course even to the right auricle of the Heart, or pus may be formed and carried with the blood to the Heart, either of which circumstances taking place, kills the patient.

DXLVII. The internal coat of the Arteries is not liable to suppuration. it will however take on the adhesive inflammation.

This we see by observing the effects of a Ligature put round an Artery. Mr Hunter has never seen an Artery suppurate except once, that was the immediate consequence of a mortification.

DXLVIII. Brain. We should be extremely cautious how at any time we open or wound the dura mater, as the exposure of the Pia. mater & Brain is in general productive of fatal consequences. The Brain will inflame, swell & protrude thro' the opening of the Dura mater, as the Cutis thro' out a fungus thro' an opening of the cuticle in the wrist. Suppuration will take place, but the patient will be destroyed before a cure can be effected.

✓ DXLIX. Hydrocele. The tunica vaginalis is a circumscribed cavity; when exposed the same local circumstances, as in the exposure of other circumscribed cavities takes place. (362.)

This being the case it is to be observed, that when the cure is attempted by seton the water being suddenly evacuated, the Tunica collapses. Now tho' the seton as a foreign body may excite inflammation, yet the tunica at the time of producing the inflammation, being in partial contact with the Testicle, it is not certain that the inflammation

161. will extend over the whole cavity, but it must in general have its progress bounded by the contact of the membranes. (362.)

DL. It is necessary we should carry this idea (349) in our minds when we prepare for the radical cure of the Hydrocele, or proper Dropsy of the Tunica Vaginalis.

DLI. The Hydrocele is of two kinds
1st When the fluid is collected between the vaginal fat & the testicle.

2^d Where the fluid is contained in a Hydrated adhering to the Tunica Vaginalis.

DLII. We know little of the cause of the first kind of hydrocele. & of the cause of the second we are totally ignorant.

Mr Bunt in his Lectures took notice of the anasarcons hydrocele, but as that is a mere symptom of Anasarca, & has nothing to do with the doctrine we are now illustrating it becomes not an object of our present attention.

A diseased testicle is frequently the cause of the first kind of hydrocele. we shall have occasion to speak of the diseased testicle hereafter.

DLIII. The radical cure of the Hydrocele is to be obtained by no other means than the obliteration of the cavity which is the seat of it. This obliteration is accompanied by

A. - Inflammation, by which the surfaces of the Tunica Vaginalis & testicle must be united

so that the cavity between them shall no longer exist, or

B.- A total removal of the membrane forming the cavity that is the Tunica Vaginalis

DLIV. The first purpose is fulfilled by one of three operations.

A.- Caustics

B.- Seton Stent

C.- Incision.

Which ever mode of operation is chosen, suppuration is to be expected, since we cannot promise to ourselves a certain cure by adhesion only: no one can have any great superiority in point of utility over the other.

Different men will have different opinions in making their choice

DLV. The second (b. 556) by the excision or dissecting out of the whole Tunica Vaginalis, except where it adheres at the back part of the Testicle.

This must be a certain mode of cure, for it is not only moving the disease, but taking away the very seat of it. The severity of the operation however together with its being followed by more violent inflammation and greater danger has brought it generally into disuse.

DLVI. No certain cure can be performed unless the whole cavity is obliterated. If any part of the Tunica Vaginalis should not adhere to the Testicle the disease

163. will return, for

DLVII. In this as in all other circumscribed cavities the adhesive inflammation may take place only in a few points, and thus the perfection of the cure may still be preserved & consequently the stimulus of imperfection will not be given to the internal surface of the Cavity.

Mr Hunter experienced the truth of these remarks in a patient upon whom he performed the operation for the radical cure by seton: soon as he evacuated the water the tunic collapsed, the inflammation excited by the exposure was not general, consequently the cavity was not obliterated. Within two years the disease returned. Stimulating injections have been practised to bring on the adhesive inflammation, and thus obtain a cure, but here we shall be too frequently foiled, and on this mode we can depend but little.

DLVIII. The adhesive inflammation will rarely effect the cure; in general an universal suppuration must take place before the purpose of the Surgeon will be accomplished.

DLIX. Tapping for the Hydrocele the wound not healing by the first intention, may also accomplish the desired effect, the same circumstance here taking place as in the peritoneal cavity after

tapping for the Asites: or accident, as a bruise producing a rupture of the Vaginal Coat and a diffusion of its contents through the cellular substance of the adjacent parts, if followed by inflammation of the Tunic may also effect a cure.

It has been usual to divide the cure into the palliative and the radical. Of the former (unless when it accidentally becomes the cause of the latter) we have little to say, since it teaches nothing respecting the exposure and inflammation of cavities. It is needful only to observe that the palliative cure consists in puncturing the tumor with a lancet or small trochar, and thus evacuating the fluid; but it is rarely that this mode does not require repetition throughout the life of the patient.

The palliative cure should not be attempted unless the patient can lie by for some time, because sometimes inflammation succeeds and the radical cure with all its consequences takes place, when the palliative only was intended.

DLX It is to be remembered that the operation for the Hydrocele is not necessary for the preservation of the life of the patient, or the support of his health, but only for the removal of an inconvenience: therefore the danger of an operation, is to be balanced against the extrication of the Patient from the present trouble. —

165 **DLX].** If a radical cure for a Hydrocele consists upon we are then (in our choice of a mode of performing the operation) to consider

- 1st the comparative dangers of the different modes.
- 2nd the comparative certainty of success of the different methods.
- 3rd the state of the Testicle.

DLXI]. The greatest comparative degree of danger attends the operation by excision () which is therefore perhaps never to be advised, this danger will arise from the sympathy of other parts of the constitution with the Testicle in this mode of operating so rudely handled and so entirely and suddenly exposed.

DLXII]. The mode by excision is most certain in its success, next to that the mode of incision: the caustic and seton are less sure in their effects.

Inflammation arising in consequence of any operation it is no unusual circumstance for a considerable quantity of coagulable lymph to be thrown out, surrounds and give the appearance of enlargement to the Testicle. This effusion of coagulable lymph also forms the sloughs that are thrown off in suppuration takes place, and which were by the author of a late publication considered as sloughings of the vaginal coat to which he imputed the cure

by Caustic; but the vaginal coat rarely sloughs, the discharged being in general false Membranes made from Coagulable Lymph. Now then however when the Tunica vaginalis is in a diseased state a partial sloughing of it may take place.

The circumstances which may give an appearance of an enlarged and diseased Testicle deserve particularly to be attended to as otherwise a Surgeon may be induced to remove it as scirrhus and incurable, the testicle requiring no such operation.

Case.

A man laboured under an Hydrocele: the tumor inflamed, suppurated, and at last ulcerated: the Surgeon enlarged the opening and finding the Testis apparently enlarged, and supposing it scirrhus was about to remove it. Mr. Hunter was desired to attend the operation: he found the suppuration of the Tunica vaginalis too general, for the complaint (in his Opinion) to be cancerous: the history of the case confirmed the opinion; the patient being extremely thin, there was no difficulty in getting the operation put by: it was deferred & he recovered from his ailment by very simple means.

Farther respecting the state of the Testicle it becomes necessary particularly to attend to it, that

167.

if the disease requires it may be necessary to attend ^{entirely} to it without the necessity of a second operation care should be taken to distinguish a swelled testicle from a dropsy of the Tunica Vaginalis: if the tumor consists of the latter it will be mostly pyriform, if the former it will be flattened. This attraction to the appearance, added to the assistance of the feel, will mostly preserve the surgeon from an error.

Again in the hydrocele the situation of the Testis should be ascertained, that we may not, if we have occasion to tap the tumor, be in danger of wounding it.

Mr Hunter by accident wounded a testicle four times, and yet no ill consequences supervened, which is somewhat singular as so much mischief frequently follows the slightest bruise of this gland.

A pulpy Testicle will be very apt to be mistaken for Hydrocele.

Again, respecting the state of the testicle we should take care to distinguish a scrofulous testicle from a cancerous one. — Mr Hunter never saw a cancer ^{of the testis} follow the radical cure of the Hydrocele.

The best means of ascertaining the state of the testicle and whether the gland forms the tumor, is the sensation of the patient's experience in squeezing the tumour. If it be a diseased testis the pain is the

same in every part. If only an Hydrocele pain is felt on preping that part alone, in which the Testis is situated.

DLXIV. All the modes of operating gives us an opportunity of examining into the state of the Testicle, that by Caustic alone excepted; the mode by incision gives the best opportunity.

DLXV. The mode by incision being the most simple of all, more certain, yet not more dangerous than either Caustic or seton, and more safe and easy than that by excision, is probably to be with justice preferred. It is performed by making an incision three inches in length or throughout the length of the tumor into the Cavity containing the water, which being evacuated poultice or crumb of bread is to be introduced every where between the two tunics and kept in by means of lint stuffed into the mouth of the wound. Bags wetted in brandy or spirit of wine, should be kept in the scrotum and often removed to prevent the too sudden coming on of inflammation, and the scrotum should be suspended in a bag-truss.

DLXVI. The advantages of knowing whether a testis is diseased or not is that if found so in a considerable degree it may be removed without the patient undergoing a second operation.

DLXVII. We cannot perhaps a priori determine whether the disease be an Hydræcele of the Tunica Vaginalis or the water be contained in a Hydatid nor is the knowledge of consequence in the cure, as in both the same mode of treatment is to be observed; but the consequences of an opening into the Tunica Vaginalis, will be different from those of wounding an Hydatid.

DLXVIII. In the former (567) the sympathetic affections, usually following an exposure inflammation of the testicle, will come on, such as rigors, nausea, vomiting, dull pain in the back & loins, great sense of lassitude, swelling of the Testicle &c. These will generally come on in twenty-four hours after the operation. But when an hydatid is opened at the body of the Testicle is not exposed, there will not arise, but only the common circumstances of inflammation, as heat, soreness of the scrotum &c.

In cases where the Hydræcele has been tapped, one would be led to suspect that the Cicatrix left after the puncture would be the proper part to perform an operation again, either for the palliative or radical cure; but this is not always the case, for the testis sometimes adheres to the cicatrix & if this rule be observed would be wounded in consequence. After the symptoms following the operation for the

radical cure, and, on enlargement of the parts always remains, which is not an enlargement of the testicle, but only a thickening of the tunica vaginalis. This gradually subsides and the parts return almost to their natural size which diminution may be forwarded by rubbing in mercurial ointment.

Hematocoele is an extravasation of blood into the Tunica Vaginalis: It is not of much consequence to distinguish it from Hydrocele as the same treatment is advisable, but it should be carefully distinguished from an enlarged Testis. Sometimes the contents is only coagulated, sometimes coagulated blood serum and sometimes the coagulated blood will be found to have become vascular.

DLXIX. The treatment of both (568) will be the same as in inflammation in general, but the scrotum must necessarily be suspended.

On the cure of Hydrocele by Seton or tent Fly, Caustic.

If the seton is used care should be taken that the skin of silk be large enough to fill up the wound made by the lancet, or seton-needle, and thus plug it up to prevent the escape of the water until a general inflammation has taken place, for the water keeping the tunic every where distended, partial adhesions will be prevented and the influence of the operation become general. (566. 567.)

177 The seton should be passed on the perpendicular axis of the tumour. The place of election for the tent should be neither at the upper nor lower part of the tumour but about midway. The water should not be suffered to escape before the tent is introduced, for the same reason as the confinement of that fluid is recommended where the seton is used. Sponge tent is preferable.

Caustic. — There is an uncertainty how deep the caustic will act. Should it not penetrate so as to include the Tunica vaginalis in the Escar, we shall be under the necessity of making a puncture thro' that membrane, and so shall gain no advantage from the use of the Caustic.

When the Escar is sufficiently deep the inflammation of the Gland takes place before the water is discharged, which here also prevents partial adhesions and an imperfect cure, but the uncertainty of the action of the Caustic is an objection to its use.

It may happen that the testicle may lie on the fore part of the Tunic, and its situation not be known, or not attended to by the Operator. If in performing the radical cure by the incision, he finds he is cutting on the body of the Testicle he should carry his knife more to the lower and outer part of the tumour in finishing his incision for fear of wounding the spermatic artery. an accident that has occasioned much mischief.

172. Fractures.

DLXX. The bones as the soft parts are subject to every stage of inflammation either arising spontaneously or being induced by external violence, and when their continuity is divided they are reunited by processes somewhat similar to those which we observe take place in the soft parts.

DLXXI. Bones are liable to solution of continuity from external violence. Solution of continuity in bone is called Fracture.

DLXXII. Fractures in bones are either

A. Simple

B. Compound

C. Compound simple

D. Simple compound.

By a simple fracture is meant a solution of continuity in a bone, without a wound communicating externally.

DLXXIII. By a compound fracture is meant a solution of continuity in a bone, with a wound communicating externally, which does not heal without suppuration and granulation.

DLXXIV. By a compound simple fracture is to be understood a fracture which has a wound com-

173

communicating externally, but which wound heals either by the first or second mode of union without suppuration.

DLXXV. The simple compound fracture takes place where originally there was no wound communicating externally, but where in consequence of some parts losing their living principle from any cause, ulceration of the integuments is rendered necessary by the circumstances of a compound fracture induced.

DLXXVI. Previous to our entering upon diseases or mode of restoration in bones it is necessary to consider the five following aphorisms

DLXXVII. Bones consist of an inanimate earthy attached to a living organised substance.

DLXXVIII. Bones may either be in a dead or a diseased state; between the death and diseased of a bone, it becomes necessary carefully to distinguish.

It has been usual to distinguish all unnatural states of the bones by the common name of caries. Caries was divided into moist & dry; moist seemed to imply a diseased state of the bone: dry the bone becoming dead. By converting the moist into a dry state a cure was frequently accomplished; why this happened will appear from 58j. 59j. 632.

The term Caries signifies a rottenness in the bone. It is evident this was improperly applied to bones

1/4 becoming dead because a dead bone is generally thrown off without the least appearance of rotting: indeed it is much more firm and solid than the margin of separation in the living bone which has thrown it off.

DLXXIX. Bones fall into disease more slowly than soft parts & when they become diseased are proportionally slower in the act of restoration: for all processes go on more slowly & difficult than in soft parts.

DLXXX. It will be necessary also to consider the doctrines advanced in 352.. 359.. 361.. 362.. 482.

DLXXXI. Also that bones receive their nutrition and means of support chiefly from the periosteum or membrane covering the bones (382) different bones varying much in their structure (577). their diseases will vary as well as the readiness with which they go through the process of restoration.

DLXXXII. When a solution of continuity happens in a bone by external violence productive of simple fracture (572) the cure may be effected by the first mode of union () without either inflammation or suppuration. In simple fractures the accident produces a rupture of several blood vessels & an immediate effusion of blood into the cavity made

175. by the division of the bone, if the Economy of the parts is not very much disturbed by this violence the blood retaining the living principle, the red parts *Hærum* are soon absorbed and the coagulable lymph alone remaining becomes vascular, the cure is accomplished with little pain and without disturbing the general system.

DLXXXIII. If so much injury is done to the parts that a considerable & unusual action is necessarily excited in them this first & most simple mode of union will not take place, but the *specific inflammation*, or that which is perfectly similar to the adhesive inflammation in soft parts, arises. Coagulable lymph is poured out into the Cavity (now similar in its nature to any natural circumscribed cavity) which is to form the callus. This becomes vascular, at length cartilaginous, and lastly *ossific matter*, as in the first formation is deposited. () & thus the cure is accomplished. Here pain, tumefaction of circumpacent parts & the common symptoms of the adhesive inflammation takes place.

DLXXXIV. In the Compound Fracture (6. 572) the cavity made by the division of the ends of the bone becomes an exposed one from the fracture being complicated with a communicating wound, the blood effused does not (as in 582) retain its living principle

17 (9) the stimulus of imperfection obliges the cavity to set up a new process, suppuration takes place & the only means of reunion left are those of granulation.

DLXXXV. As in wounds made into circumscribed cavities, if the lips of the wound come in contact & unite either by the first or second mode of union before the stimulus of imperfection gives the alarm to the cavity, a suppuration of the whole cavity does not necessarily take place; so in the compound simple fracture, if the external wound is thus made to unite before the blood effused into the cavity has lost its living principle, and the stimulus of imperfection has given rise to a new process, the cure may be accomplished with the same ease as in the simple fracture. -

DLXXXVI. But it may occur that either a splinter of bone being detached and dying, or the extravasated blood losing its living principle, or from a misplaced end of ^{the} bone producing ulceration of the integuments, or an irrecoverable injury being done to the parts covering the bone, that ulceration even to the exposure of the cavity is produced in this case which we term a simple compound fracture. the same circumstances will take place in the compound fracture (584). -

DLXXXVII. When a part of a bone becomes dead, exfoliation or the throwing off the dead part from

177 The living must take place, in which the process of exfoliation consists we shall hereafter shew.

DLXXXVIII. When the surface of a bone is exposed it is very common for a portion of it to become dead, and a necessity for the process of exfoliation to take place, for the bone receiving its nutrition from the surrounding periosteum, that being destroyed or becoming dead, a part of the bone must lose its means of support.

It can scarcely happen that any large portion of the periosteum shall be destroyed or become dead, without a consequent death of a portion of the adjacent bone. Only a small extent of periosteum is destroyed, exfoliation of the bone does not always follow, because its life will be still supported by means of its vessels anastomosing with those that pass from the periosteum nearest to the exposed part.

DLXXXIX. The union of broken bones is more slowly accomplished than that of the soft parts, because in the former two processes are to be accomplished, viz the formation of soft parts, and then the formation of bone.

DXC. The ossific inflammation arises when there is an increased disposition in a part to form bone.

DXCI. It consists in the vessels of the bone, or the parts covering the bone taking on the same action as the vessels of the soft parts do in the adhesive inflammation.

DXCII. The consequences will be similar, for it will produce tumefaction & enlargement of the bone: if

extending from one bone to another, between which and the other there is a natural motion, it will produce anchylosis; like as the adhesive inflammation produces immobility in the soft parts to which it extends. it will be followed occasionally by suppuration & ulceration.

Of this we have instances in anchylosis of the vertebrae of the spine, especially in Horses; between two or more of the vertebrae of these animals it is common to have an Anchylus formed.

DXCIII. The causes also of the ossific inflammation will be similar to those of the adhesive - external violence, as exposure and pressure; a receptivity for action in the vessels of the bone or its membranes & may give rise to it.

Pressure will not uncommonly occasion ulceration and absorption of bone, but may also excite the ossific inflammation & a thickening of the bone.

DXCIV. The final intentions for which the ossific inflammation may be employed, are, first, to produce restoration of the parts and reunion in a diseased bone: and secondly, to strengthen weak parts.

DXCV. The seat of disease in bone can only be in its living parts.

DXCVI. The more spongy and soft the bone is or the more living matter it contains, the more liable it is

179 to disease: the harder the bone, the less ready, it is to fall into disease, but a death of some of its parts is more easily induced.

DXCVII. When a bone becomes diseased, it is our business to get the better of the disease: but when a bone becomes dead nothing can be done but to produce exfoliation.--

DXCVIII. The treatment of diseased bone is rendered difficult by the impossibility in general of discerning the extent of the disease.--

DXCIX. The inflammation and suppuration may have its seat either on the surface of the bone, or within the substance of the bone, or in the medullary substance.--

DC. Hard bones becoming diseased are more difficult of cure than soft ones: and when cured are more liable to fall again into a diseased state.

DCI. Bone is liable both to ulceration & to interstitial absorption.

DCII. When a portion of bone becomes dead & the process of exfoliation is performed by the dead bone giving a stimulus to the living bone in contact with it, and to which it adheres by the attraction of cohesion, the living parts immediately in contact with the dead bone are absorbed, and a cavity between the dead and living surface is formed: the former now being a mere extraneous body is according to a law

in the animal economy () carried from within outwards and at length thrown off from the body, ulceration of the integuments having made way for its exit. the cavity is filled up with granulations which become new bone.

The first appearance of separation in order for exfoliation is a spongius in the living bone, now becoming more vascular: next a groove is formed in the direction of the fibres that surround the dead bone: the living bone becomes softened and more porous: part of the dead bone seems to be sometimes absorbed, for it has the appearance of having undergone ulceration.

It is certain the absorbents have a power of taking up dead bone: the absorption begins at the circumference and is continued to the centre. In the skull they become first membranous, nature observing the same order in the repair of bone as in its first formation: a pulsation in the granulation often attends the exfoliation of a bone.

Granulations will sometimes arise short over the edges of the bone to be exfoliated and prevent its being thrown off so soon as it otherwise would be; in this case it excites new inflammation & ulceration.

DCIII. Granulations will arise from the surface of bone without suppuration having proceeded, but this only where that surface has not been exposed to a penetrating wound.

The granulations forming bone irregularly, become often a considerable obstacle to the cicatrization of the ulcer, after the process of ossification is finished.

DCIV. A thickening of the periosteum and integuments has often been mistaken for an enlargement of a bone.

DCV. A bone may be enlarged without any alteration in its original structure, by bony matter being formed on its natural surface. This laying on of new bone will arise from the ossific inflammation taking place in the periosteum or on the substance of the bone.

DCVI. Or a bone may be increased by the ossific inflammation taking place in its substance, which causes an alteration in its structure and enlargement of its dimensions.

DCVII. A bone may be increased in size, at the same time there is an absorption going on in its substance; for the ossific inflammation may be laying on new bone on its surface, at the same time that absorption is removing portions of its more internal substance: thus a bone may at the same time be increasing in its dimensions and losing in its quantity.

DCVIII. Suppuration may take place either on the surface or in the substance of a bone.

DCIX. Matter when formed may be confined if in the substance of the bone, by the natural bone remaining unulcerated, through its substance, & thereby preventing its exit, or if on the surface of the bone by the osific inflammation forming a case round it, of a new or adventitious bone; but in the latter case the progress of the suppuration must be rapid, otherwise there will not be time for the bony case to be constructed and the matter will make its way to the skin as in the common deep seated abscess.

DCX. Matter may be also confined on the surface of the bone for a considerable time, simply by the thickening of the Periosteum, just as it is confined by the Fascia in a Whitlow.

DCXI. The periosteum and the cellular substance connected with it may take on the osific inflammation.

DCXII. Suppuration taking place in the substance of a bone & the osific inflammation being also taken on by the surface of the bone and the parts covering it, the matter will produce a disposition to the ulcerative absorption which will be continually removing large portions of the internal substance of the bone, the osific inflammation at the same time depositing new bone on the outside: thus

183. The bone may be enlarged to any size, and these two processes - absorption within & ossific disposition without going on together - the dimensions of the bone will be wonderfully increased. At the same time that, perhaps, the original bone shall be entirely removed, and even some of the internal parts of the new bone shall be taken away and at last instead of a solid bone, only a large long case shall remain, from which at length the matter shall be evacuated. Ulceration within may however go on even after the matter has made its escape.

DCXIII. Ulceration is the sequel of suppuration: it removes the effects of the ossific inflammation: when ulceration has gone thro' the surface of a bone it effects 1st the periosteum - next the muscles & lastly the cellular substance of skin.

DCXIV. Bones, when the first & second modes of union fail, are (as here before observed) cured by the formation of granulations, and those taking on the ossific disposition.

DCXV. But it sometimes happens that the ossific disposition shall not be taken on by the granulations between the ends of the bone, so that there shall be no union by bone, the restorative process going no further the production of granulations, or the change of them into cartilage.

DCXVI. It sometimes happens that no union at all is formed between the separated ends of the bone, so that there shall be no union by bone even after a simple fracture: in this case a new joint is formed, the ends of the bone become covered with cartilage, as in all other articular cavities a power of secreting synovia is given to it, and it is in every respect similar to any other joint, except the want of the proper moving powers: (that is) corresponding muscles. These not being generated the new joint becomes extremely inconvenient.

DCXVII. If inflammation may terminate in a suppuration, or the bone may remain swollen, but indolent.

DCXVIII. Infestation of bone is of three kinds. *viz.*

A. - External	} Infestations..
B. - Internal	
C. - Mixed	

DCXIX. The process of simply external Infestation has been already considered (602) It happens also that an internal part of a bone shall become dead, becoming dead, it gives a stimulus to the surrounding living parts, as an extraneous body must ultimately be thrown off, for all parts (as has been shewn) admit readily the passage of foreign

185. bones from within outwards — hence from its stimulus, the ulcerative absorption is finally produced in the surrounding parts, and a passage is given at last to the dead bone. In consequence of the stimulus granulations also arise and fill up the loss occasioned by the separation of a part of the bone, and these granulations becoming bony the cure is accomplished.

DCXX. The mixed is when the external exfoliation becomes an internal one, which is accomplished as follows. — At the same time that the process of absorption goes on for removing the dead bone from its contact with the living parts, the parts in the neighbourhood take on the osseific inflammation, and in the end forms a bony case round the dead piece of bone and prevents its exit.

This nature seems to be counteracting her own ends, but the final intention of this bony case seems, to be an hasty attempt to obviate the weakness of the Limb, that might spring from the extent of death in the bone.

DCXXI. Bones commonly become painful before a swelling of them is perceived.

DCXXII. The matter discharged from diseased bone, or when the process of exfoliation is going on

186.

is seldom laudable pus and is extremely disposed to putrify, tinging the probe of various colours.

This happens.

- 1st because it is the matter of diseased parts.
- 2nd because the continual irritation of the bone (like other irritations) induces a flow of thin matter.
- 3rd because there is commonly some blood mixed with it, which soon becomes putrid.

DCXXIII. When the skin is affected, (that is when the inflammation of the bone is communicated to the skin) suppuration commonly takes place.

DCXXIV. The periosteum becoming inflamed and its internal surface taking on suppuration, a disease, or death of the more external parts may be induced.

DCXXV. The hard bones have fewer living parts, & of course fewer vessels than the soft bones. They are therefore more easily destroyed by any destructive cause whatever. It is scarcely possible to lay them bare to any considerable extent, without death & exfoliation being the consequence.

DCXXVI. Where the osific inflammation, or the inflammation of a bone, requires the assistance of art it is to be treated by Antiphlogistic remedies, and by insisting upon rest being given to the part.

18th affected, and if in the lower extremities that the patient lie in an horizontal position.

When the swelling of the bone becomes indolent the parts are to be roused into action, & if possible interstitial absorption excited by the administration of mercury both internally and externally. The mezerion root has been much recommended as a specific in the enlargement of the bones.

The quantity of mercury to be used may be somewhat less than that fitted for curing a pox.

DCXXVII. If the seat of supuration is the surface of the bone, or the internal surface of the periosteum, the matter should be evacuated as early as possible, and this by simple incision through all the integuments down to the bone, but without removing them, and more especially if the cranium is the object of our consideration.

The integuments need not be removed because if exfoliation is to take place it will prevent granulation. & the healing of the wound, which will not close while there is bone to be thrown off. (See Doctrine of Gunshot wounds) -

DCXXVIII. Sometimes in this superficial supuration, bones are so much diseased that they have not a disposition for restoration, and the bone will

not exfoliate unless the actual cautery be used.

DCXXIX. In a case of suppuration in the substance or in the medullary substance of the bone (which is the worst case by far) the matter is to be evacuated by the actual or potential cautery, or trephine.

DCXXX. Bones which have undergone external ulceration often fall into an indolent state, in which cases stimulating dressings are to be used.

DCXXXI. When the actual Cautery is applied we must use an iron of a thickness sufficient to give a degree of heat in proportion to the depth of the bone. The time of continuing its application must also be directed by the same rule.

DCXXXII. Caustics may produce a cure of diseased bones by inducing a death of the diseased parts, & so render the process of exfoliation necessary; but in order to have this effect, their action must produce the death of the whole diseased part.

DCXXXIII. The actual cautery induces not only the death of the diseased parts, but an inflammation in the sound parts, and this hastens the separation of the part to be exfoliated. The potential Cautery rarely does more than produce the death of the diseased bone. —

189. DCXXXIV. However a natural spontaneous exfoliation is much more to be desired than an exfoliation produced by art, because of the uncertainty of our endeavours to extend our operation to the whole of the diseased bone.

DCXXXV. Of specific diseases producing disease in bone and consequent exfoliations, the exfoliation goes on more readily and kindly from the venereal disease than from scrofula or others. In scrofula the extent of the disease is more considerable, whereas the venereal is more partial and confined to a narrower limit.

DCXXXVI. When after a solution of continuity in a bone the cure proceeds no further than a soft union, the rest of the limb should be discontinued to excite, if possible a further disposition to the act of restoration in the parts.

DCXXXVII. When the fracture with the circumstances (636) is in the lower extremity, care must be taken by means of splints & iron work, that the whole weight of the body does not rest upon the fractured bone.

Mr Hunter has seen patients who have fractured their legs, in whom firm union would not take place until they were set upon their legs, the fractured bones being well supported and defended by splints &c. —

DCXXXVII. When a new joint is formed (616) the observation and precaution are also to be attended to.

DCXXXVIII. But it may sometimes be desirable to attempt the destruction of the new formed joint and procure firm union between the ends of the formerly divided bone, in this case we are to consider the doctrine of inflammations of cavities and particularly that of the cavities of joints. (528^v). -

DCXXXIX. The mode of accomplishing this purpose will consist in producing in the new articular cavity, the stimulus of imperfection, by making an opening into the joints & introducing some foreign body to prevent healing of the wound by the first or second mode of union, and excite universal suppurative inflammation, which being followed by granulations, and those granulations becoming bony the ends of the bone will be immediately united.

It must be evident that the less time has elapsed since the formation of the new joint, the more readily its destruction will be accomplished. -

DCXL. Diseases of bone may have powerful influence on the constitution. We may readily conceive the effects of a long & constant continued pain, want of rest & motion are these attendants. - We also know they will bring on hectic, and this is accounted

191. for by what is advanced on hectic (4/9th).
DCXLII. When ulceration has removed so large a portion of the bone that the remainder on account of its weakness shall be unable to support its necessary actions. Or where disease extends through a greater part of the substance of the bone, than art can restore to health; or procure a separation of diseased from the sound parts; or where there is an inability of the constitution to support the disease, or the processes necessary to healing.

Amputation becomes indispensable.

DCXLIII. In simple fractures if the patient be healthy the union of the bone will be generally accomplished in about three weeks; but something sooner in the upper than in the lower extremities.

DCXLIV. Rest, retention of the bones in their natural position, freedom from pain, and the prevention of inflammation, are the general indications in all fractures of the extremities. - Whatever position of limb best fulfils these indications is the position to be recommended.

DCXLV. To prevent the displacement of the ends of the bone we use splints and bandages.

DCXLVI. Of the different species Fractures enumerated (5/2) the compound is the most dangerous & frequently

attended with troublesome & fatal symptoms, as
fever, symptoms of dissolution, gangrene &c.

DCXLVII. We can rarely keep the bones perfectly at rest
in bad compound fractures, hence constant irritation,
pain &c.

DCXLVIII. The same indications are to be fulfilled in
the compound as in the simple fracture. (382.) We
should move the limb as rarely as possible. Poultices (tho
they should otherwise seem desirable applications) in
compound fractures become injurious by their ad-
mitting of motion in the ends of the fractured bone.

DCXLIX. The simple compound fracture is attended
with less danger than the compound fracture, altho
the former may produce troublesome and dangerous
symptoms.

DCL. The treatment of the constitution when affected
by the consequences of compound fracture will be
best understood by referring to 462. & 479.

DCLI. From what has been said it must be evident
that when a fracture of a bone is complicated with a
communicating wound of the parts that cover it, as
muscles, cellular substance &c. it must always be
the duty of the surgeon to endeavour to render the case a
compound simple fracture, to which end he will be
careful to remove extraneous bodies which may
hereafter produce the stimulus of imperfection: to

193. place between the bones in their natural site, and prevent their irritating the soft parts; to bring the soft parts into contact one with the other: in short to observe the rules laid down in cases of wounds with cavities in the doctrine (682.).

DCLII. In bones as in soft parts, the observation that all new formed are weaker than original parts, holds equally good.

DCLIII. In bones as well as in soft parts, the process of restoration goes on more readily in the upper than in the lower extremities. Compound Fractures therefore considered as injuries done both to the bones and to the soft parts are more dangerous in the leg than in the arm or fore-arm.

DCLIV. Fractures of bones which communicate with the cavities of joints whether simple or compound require peculiar attention, and peculiar treatment, as

- 1st The fracture of the patella,
- 2^o — — — — — Pteranon,
- 3^o — — — — — of either ankle.

DCLV. Also when a fracture happens near a joint the bone may be so splintered as to communicate with it.

DCLVI. In case it be a fracture attended with a wound of the joint communicating externally, the wound must be healed if possible without suppuration

which arising, will occupy the whole cavity of the joint and too often produce a necessity for amputation.

DCLVII. If a simple fracture communicates with a joint cavity, the bond of union will escape into the cavity of the joint & form a case similar to compound fracture.

DCLVIII. The fracture of the bone will heal by the third mode of union or granulation, (the first & second being lost by the escape of the bond of union into the cavity of the joint) except that here there will be granulations without suppuration preceding (603). In cases of fracture communicating with a joint, it is apt in the cure to produce stiffness & loss of motion in the joint from the blood escaping into the cavity and becoming organized. In this case as soon as the fractured bones are united by callous it becomes necessary to give passive motion to the joint & often repeating it. When the callous is confirmed the patient should diligently exercise the part affected by constant motion of the proper muscles.

DCLIX. When the patella is fractured, the union of the fractured parts will either be by bone or ligament.

DCLX. If the fractured parts remain in contact or very near to each other, the union may take place

195. ly bone, as in the fracture of other bones, but if the fractured portions are at a distance from each other, union by the formation of ligament will be the mode adopted.

DCLXI. For the patella being employed in the formation of a joint, an union by lengthening the bone two or three inches must have been extremely inconvenient to the patient and incompatible with the future motions of the knee.

DCLXII. The patella being the point to which the principle extensor muscle of the Leg^a is inserted, when fractured transversely, the muscle being now no longer confined contracts itself & draws the superior portion of the fractured bone to a considerable distance from the inferior.

DCLXIII. When the union is formed by ligament as is always the case when the fractured portions remain at a considerable distance asunder: the patella is very much lengthened and the two points of attachment of the rectus muscle being therefore brought much nearer together, the muscle must be considerably shortened.

DCLXIV. As the original length of the muscle is diminished, its power of contraction must be diminished in proportion; for the two ends of the muscle have in consequence of the action approximated themselves

nearly or entirely as much to each other as they were accustomed to do in voluntary action, — hence it is evident the powers of extending the limb must remain lost, without the muscle acquires a new action, thus accommodating itself to the present circumstances.

DCLXY. The muscle will however acquire a new action in time, and moreover will be enabled in time to shorten itself so that by its contraction the power of extending the limb shall return to the patient.

DCLXVI. This power will be sooner restored if the Surgeon and the patient join in their endeavours to induce in the muscles a habit of acting.

DCLXVII. This is to be done first by giving passive motion to the limb, and then by the patient's exerting attentively the influence of the will upon the part.

DCLXVIII. For the muscles being originally under the influence of the will, if the powers of volition are resolutely and industriously exerted, will in time recover the pristine action, and voluntary motion of it will be restored.

✓ Lady B. — broke both her patellas; they were reunited by ligament and she lost entirely the power of extending her legs, & consequently was unable to walk. She had been in this state two years when Mr Hunter saw her, & conformable to the principles

197. laid down in the text, he set her upon a table with her legs hanging down over the end of it. He desired her to think attentively on extending her leg, and try by the powers of the will to raise it forward. At first her mind had not the least influence on her leg, but by repeatedly determining the influence of the will to the muscles & repeating this endeavour several times for two or three days she gained trifling power of extending her legs. By persisting in the same means she increased that power so as to be able to extend them completely. She was then directed to raise her leg with a small weight affixed to her toe. This weight was gradually increased. At length she was set upon her feet & obliged by an attempt to walk to exert greater force. By daily exercising the muscles in this manner (and gradually increasing their labour) she was at last restored to the use of her legs, which were formerly considered as irretrievably lost.

DCLXIX. If the union is formed by bone, from the irregular formation of the callous a bony ridge may be raised on the internal surface of the patella which may impede the future motions of the joint.

DCLXX. It must be evident that the knee should be kept straight & that in order to the retention of the bones in their approximated state, we must

apply a bandage rolling the thigh from above downwards to prevent the involuntary contraction of the Rectus Femoris. Also that rest should be insisted on. The Surgeon should repeat his motion of the Limb once in two or three days. Afterwards more frequently, until at length proper time comes for the patient to exert self motion (See Chap. Biscan 168.)

DCLXXI. The union of the bone will be much sooner accomplished by bringing the separated portions of bone near together & retaining them in that situation. For this means the muscle will not lose its original length, and of course its powers of contraction: consequently less difficulty will hereafter arise to the patient in extending his limb. The evils of irregularity of callous & stiffness of the joint may be prevented by the attention of the surgeon.

DCLXXII. When the cure has been attempted as soon as reunion has ^{begin to} take place, a slight degree of passive motion should be given to the Limb, and as soon as union is perfected, voluntary or self motion should be insisted on.

DCLXXIII. The Olecranon is to be considered as a fixed patella and the principles allowing for that difference will apply to a fracture of it.

The Triceps Extensor Cubiti muscle being fixed to the olecranon, when a fracture of that process take

199. Place, the superior portion of the bone will be drawn upwards by the voluntary contraction of the muscle. In the cure the superior portion is to be brought downwards the arm for some time kept extended until union begins to take place, and the action of the Triceps is to be checked by bandage. When union is partly formed, as after a fortnight it will mostly be, then passive motion is to be given to prevent stiffness of the joint, and lastly when the union is completed, a voluntary motion, as in the case of the patella.

After muscles have acquired a new action the next step is to give them strength, which must be done by frequent exercise. It is to be observed that the greatest possible contraction of a muscle is somewhat more than the motion of a joint which it serves, admits of. Hence when the patella or olecranon is fractured, the extensor muscles will be shortened more than they were in voluntary action.

DCLXXIV. When the ankle bones are fractured they are only to be considered as bones marking joints, & not as liable to be influenced by the action of muscles, none of which are inserted into them. They are therefore to be returned, if any displacement has happened, to their natural situation and retained in it by bandage &c. When union has begun to take place between the divided portions of bone motion sh^d be given to the joint.

DCLXXV. Cartilage is an animal substance intermediate between the hard & soft parts, approaching very much in its nature & properties to horn. It has few vessels; is insensible; has little or no power of absorption; does not swell from pressure; is not liable to exfoliate even when exposed & scraped; never goes into suppurative inflammation; nor even ever being the basis of granulations. *It readily calcifies.*

DCLXXVI. Cartilages may be divided into two kinds.

A. The permanent.

B. The changeable.

DCLXXVII. The order A, are such as remained unaltered during life, such as ^{the} the nose & ear.

DCLXXVIII. The order B. (C/b) are two fold,
 1st those which at a certain time become bone ~~for~~ which before puberty served as a substitute for it, such are the Epiphyses of bones, which in the infant are cartilaginous; in the adult are bone.

2^d those whose change into bone takes place at an uncertain time of life, and sometimes are never changed into bone, as the cartilages of the ribs & the ends of the cylindrical bones.

DCLXXIX. When Cartilages are exposed they do not exfoliate like bones, nor do granulations arise

from them, but granulations arising from the circumjacent soft parts on all sides, shoot and meet over them, thick & loosely covering them without adhering.

Mr Hunter has once seen a cartilage disbecome black & thrown off with a portion of bone lying under it. This is also the case in white swellings the cartilaginous ends of bones being absorbed, the bones are removed together with the cartilage.

Mr Bromfield amputated the arm of a young woman at the shoulder joint & she recovered. Several years afterwards she came into St George's Hospital where she died. On dissecting the shoulder on which the operation had been performed, it appeared that the granulations and soft parts were not the least adhered to the subjacent cartilage, which they covered loosely like a purse. The same thing happens when fingers are amputated at joints. Mr Hunter has seen the cartilages of the Larynx only exfoliate but they have previously been ossified, & become bony substance.

DCLXXX. When the permanent cartilages are divided the reunion is formed by cartilage, but when the changeable cartilages undergo a solution of continuity they are consolidated by a bony union.

DCLXXXI. When the changeable cartilages inflame they take on ossific disposition: when they fall into disease they also become bony.

DCLXXXII. Cartilages seldom admit of the ulcerative process, they are however liable to undergo contiguous absorption from the sympathies of the surrounding parts.

DCLXXXIII. Joints, if we judge of them by the laws of mechanics, are in general very ill formed, but this deviation from mechanical principles fits them for a variety of actions, to which had the rules of mechanics been strictly adhered, would have required a number of additional joints.

DCLXXXIV. In considering the structure and properties of joints we are also take into account the Ligaments and muscles.

DCLXXXV. The ligaments in general serve as pivots.

DCLXXXVI. The ligaments of some joints regulate the motion of the joint, but there are only such as are moved in one direction only, as the two upper joints of each finger; others only serve to sustain and support.

DCLXXXVII. The powers that give force & firmness & direct the action of the muscles. The muscles support the joints in the motions they have to perform.

The lower jaw seems an exception to this. The depressors are always attempting to dislocate the jaw, but the elevators keep it firm in its

203. Socket. Opening the mouth does not give firmness to the joint. We see in immoderate yawning the jaw will, sometimes, be dislocated; the elevators here either for a time losing the power of action or being overcome by the powers of the depressors. The latter are not inserted near the centre of motion.

DCLXXXVIII. From knowing that the strength & weakness of a joint depends in a great measure on its muscles, we are enabled to account for several circumstances otherwise inexplicable.

DCLXXXIX. Joints are capable of motion either passive or active; by the former we mean motion given to a joint by external force: by the latter that motion derived solely from its proper muscles.

These Aphorisms require considerable attention. It is observed (48) that the voluntary muscles may, occasionally, act of themselves & independantly of the will, & this may be either from disease, as in spasm or from a kind of consciousness in themselves of the necessity of acting. When a man is descending from an eminence, as when he is descending down stairs, the muscles are all prepared to support the knee & ankle so as to prevent their giving way, and of course being strained, or any jarring between the bones that compose them; and this without any direction of the will, but simply from a kind of attention in the muscles to the security of the joint. But if a man in walking along a plane

suddenly steps down a descent to which he is not aware, the muscles being unprepared for the exertion and off their guard, do not give firmness to the joint, and in this sudden action a jarring and strain of the parts composing the joint takes place. Hence we see why strains so often accompany falls. When a man falls from an eminence, it being uncertain what part should immediately receive the shock, no particular set of muscles can prepare themselves to support the joint against injury.

We gain much information on this subject from considering the co-operation of muscles; this will enable us to learn why a man shall jump from a considerable eminence to the ground without injury, yet from a slight fall shall violently strain the parts subservient to some of the joints of the body. If we but eagerly clutch our feet, we find not only the muscles of the hand in action, but a degree of rigidity pervades the whole body, the general system of muscles co-operating so as to give additional strength to the primary ones, or those immediately concerned with the hand. This is the peculiar instance of the co-operation of muscles, that when a man is about to jump from an eminence, not only the muscles of the legs prepare themselves to give firmness to the joint and resist violence, but, also all the muscles of the body exert themselves likewise.

to give general firmness, and by their general co-operation to assist the muscles, of the legs in overcoming the violence of the fall. If we suddenly raise an animal (as a cat) upwards, the body being elevated, its muscles are relaxed, but the moment we cease to let its body sink towards the earth, the whole muscular system becomes in action, and a degree of rigidity is sensible throughout the body. The same holds good with a child. If in playing with an infant (tho' ever so young) we toss its body towards the heavens, its muscles, while it is going upwards remain lax and at rest, but as it descends towards the earth they all become rigid & firm, prepared as we may say to receive the shock of violence.

If a man intentionally jumps from a considerable eminence to the ground, (as from a housetop) his knees or ankle joints are injured because the power of the muscles (although prepared to resist violence and give firmness to the joints) is less than the force with which his body comes to the ground: and the greater force overcomes the lesser.

If a man jumps out of a carriage in quick motion, he generally injures his knee or ankle joints from the same cause: for altho' he does not in this case jump from any great height, yet the propulsive force of the carriage (out of which he is thrown, as a stone out of a sling) added to the weight of his own body, combine to give a greater shock than the resisting power of the muscles can support.

In these cases the degree of violence, forcing the joint to passive motion & that perhaps in an unnatural direction, is superior to the power of the muscles to give firmness & resistance to the joint.

DCXC. Strains always arise from a weakness of the muscles in question, or from an inattention in them to the task they have to execute, being then taken in surprise.

DCXCI. If the force of passive motion given to a joint be greater than the powers in the muscles to give firmness to that joint, then a strain or some other injury to the joint will ensue (687. 689)

DCXCII. The muscles themselves as well as the joints suffer from strains, and this from the same cause, being obliged to act unprepared, or being obliged to resist a force superior to their powers.

DCXCIII. Dislocations arise from the causes as strains, and it is not impossible but fractures of bones may also be produced by them.

DCXCIV. Crookedness of the spine may also originate in a deficiency of muscular power: the muscles of the back not being able to sustain the trunk in its erect position.

DCXCV. The same cause probably gives occasion to knocked knees. We rarely see very muscular people fall into these states.

DCXCVI. The powers of the muscles in preserving joints, being overcome by the violence of the external force applied, the joints give way to the violence as far as the ligaments will allow. These are stretched to that side to which the joint bends, and these ligaments are not unusually torn.

DCXCVII. The joint being thus injured the following circumstances may arise, viz.

Tumefaction of the joint, and this almost instantaneously,

Echymosis

Heavy dull pain in the part. ()

Sicknefs. ()

DCXCVIII. The tumefaction arises from an increased secretion of synovia added to the other common causes of tumefaction from external injuries.

DCXCIX. The parts which are the seat of pain, though in their natural state insensible, now acquire great sensibility. & this sensibility leads to a natural cure by incapacitating the patient for motion, & necessitating him to remain in a state of rest.

Dec. In the treatment of Strains & Injuries of the ligaments parts of joints, the indications are

1st Rest.

2^d Topical Bleeding, as by Leeches

3^d The application of cold water, Vinegar

Spirit of Wine &c or fomentations. —

DCCC. But the powers of restoration being here weak, the cure will in general be tedious & too often imperfect: the joint sometimes never recovering its original health.

When joints after an injury recover their health it is probably only their ligaments are injured, & not the cartilages.

DCCXI. The common causes of sprains (690) will be also the causes of dislocations.

If dislocations are not early reduced the parts rec^d the dislocated bone adapt themselves to it.

DCCXII. When a bone is dislocated, its end is thrown beyond the articular surface of the bone with which it is naturally conjoined.

In speaking of dislocations we say the bone furthest from the trunk is dislocated. Thus when there is a dislocation at the elbow joint, we say the ulna is dislocated not the humerus.

DCCXIII. The bone being thus displaced the action of the muscles inserted into it draws it upwards, so that the limb (if one of the extremities is concerned) appears generally shorter than its fellow, and if suffered to remain long so the reduction is frequently impossible. —

209. DCCV. In attempting the reduction of a dislocated bone, the indications are

1st to make the naturally most immovable part, a fixed point.

2^d to overcome the action of the muscles which draw up the dislocated bone and resist its receiving its natural situation.

3^d Then by making laterally pressure to force the head of the dislocated bone into its proper place.

Here then a retrograde motion is to be observed, and the last action in the dislocation is the first to be overcome. The last action is that of the muscles drawing up the dislocated bone, & their force being overcome by distention in a proper direction, and by it the head of the bone being brought to the edge of its receiving articular surface, is then by lateral pressure to be forced into its place. The humerus is the bone that is most frequently dislocated, & its reduction is rendered difficult amongst other causes, by the scapula being a moveable bone. It is of the last consequence sometimes to make the scapula steadily fixed. A great variety of motion & a great degree of mobility is incompatible with great strength. This is the case why dislocations of the Humerus so frequently occur. - Now far the ligaments are lacerated in dislocations is not yet ascertained.

DCCVI. If a dislocated bone remains in its unnatural state a considerable time, and in contact with a bony surface, by degrees it forms itself a new socket. The bone against which it presses undergoes absorption and the adhesive inflammation arising in the parts around, a new joint is formed. These may be called *receptive joints*.

This most commonly happens in irreducible dislocations of the thigh bone, for its head comes in contact with the os ilium. This may also take place in certain dislocations of the Humerus where its head happens to be placed against the scapula. The *receptive joints* are very similar to simple fractures not uniting. (616)

DCCVII. Joints are more subject to fall into diseased habits than any of the other circumscribed cavities & this from the nature of the materials of which they are composed. Some joints are more frequently the subject of disease than others, from being more exposed to injury, as the knee.

DCCVIII. Joints are subject to the adhesive, suppurative, & ulcerative inflammations, and to specific diseases, as scrofula.

When a joint inflames it swells & becomes extremely painful. Inflammation of a joint always requires great attention. Inflammation arising spontaneously is in general more dangerous than inflammation produced by external injuries.

211. DCCIX. Scrofula may be brought into action in joints having a disposition to it by any external violence.
DCCX. The adhesive inflammation is not carried to the same extent in cavities of joints, as in other circumscribed cavities, because adhesions being produced would render a joint useless, but the inflammation runs into suppuration, or the inflammation becomes of the scrofulous kind.

DCCXI. Inflammation of Joints whether arising spontaneously, or from violence requires.

Rest, topical bleeding; sometimes blistering & general antiphlogistic treatment. But as soon as the disease becomes stationary it is to be considered as falling into a scrofulous state, and the treatment of scrofula had recourse to.

DCCXII. If a joint takes on suppuration every joint of its cavity falls into it. Abscesses in the joint should always be prevented if possible as they are productive of the greatest evils.

DCCXIII. The suppuration here rarely goes on kindly: it is a mixture of the adhesive & suppurative inflammation: the parts want power to carry on readily any process: even ulceration goes on very slowly, and a considerable time is taken up in bringing the matter to the skin. —

DCCXIV. The ends of the bones forming the joint here become ulcerated; indeed the bones seem to accept of the ulcerative absorption more readily, than the other parts employed in forming the joint.

DCCXV. From the backwardness or inability of the parts to commence the process of restoration, and the constitution being long seized by an incurable local disease. *Hætic* () is produced & the patient is destroyed, unless saved by amputation, which in general it is the best to perform early.

DCCXVI. Diseases of the Joints more readily produce *hætic* than diseases of the bones, in which the joints are not affected. Should circumstances more kindly arise, and the suppuration & ulceration go on quickly, it may happen that granulations may arise & cure be obtained without the loss of the Limb, and only with abolition of motion in the joint.

DCCXVII. When motion is lost in a joint, *Anchylotis* is said to have taken place.

DCCXVIII. *Anchylotis* is produced by two causes, viz-
 1st an immobility of the bones produced by a change in the soft parts forming or surrounding the joint.

2^d an immediate union between the bones themselves. —

DCCXIX. Anchylosis is of five kinds. *Whe-*

1st Lateral Anchylosis. - as between two ribs. This is seldom inconvenient, but if it takes place between the radius & ulna, hindering the pronation & supination of the hand. It happens when two bones ^{are} within reach of osific inflammation arising in either of them..

2^d Surrounding parts becoming bone

3^o The capsular ligaments of joints taken on the osific inflammation becoming bony.

4th Granulations arising on the soft parts in a joint, and afterwards becoming bone.

5th The ends of bones, forming a joint, becoming ulcerated and granulations taking place, these granulations uniting, becoming bony, and in fact forming the two bones into one..

These circumstances are similar to a fractured bone being united by granulations as in compound fracture.

DCCXX. When in consequence of preceding inflammation, or any other cause, a stiffness & partial loss of motion takes place in a joint, the joint preserving its original structure, or at least with little alteration. We can often restore its use by giving it a passive motion, frequently repeating it, as advised after fractures communicating with joints. (658.)

214. DCCXXI. The powers of flexion are more easily restored to a limb than the powers of extension

DCCXXII. When joints communicate or are in contact with each other, as those of the Tarsus & Carpus, suppuration beginning in one joint will generally extend itself throughout the whole, and all of them will equally fall into disease.

DCCXXIII. A loose, cartilaginous, or bony substance is sometimes found in the cavity of the knee joint. This may be formed in the following manner, some blood being extravasated into the cavity of a joint may become organised, and at length cartilaginous or bony. Not being an original formed part it may in the motions of the knee be broken off from the part in which it had been formed, and thus be found loose in the cavity of the joint.

Gun-shot Wounds.

DCCXXIV. Gun-shot wounds are to be considered in general as wounds accompanied with contusion: they are followed by the same effects, & require the same mode of treatment.

DCCXXV. These wounds being made by a projectile body driven with violence against a part, the extent & degree of injury will be in proportion to the magni-

215. trade of the projectile body, and the velocity with which it is driven against a part.

DCCXXV]. The danger of Gunshot wounds is to be estimated according to the nature of the part or parts injured, and the degree & extent of the injury.

DCCXXVI]. Many circumstances will depend upon the degree of velocity which the projectile body is driven against a part, as

1st The greater the velocity of the projectile body, as a ball, the more the wound will be made in a straight line.

2^d The greater the velocity of a ball, the more the wound approach the nature of an incised wound.

3^d The greater the velocity of the ball, the greater will be the danger of Hemorrhage.

4th The velocity of the ball will decrease in inverse proportion to the obstruction given to it.

DCCXXVII]. Gunshot wounds, as all other wounds from Contusions, are attended in general with less Hemorrhage than incised wounds. & gunshot wounds are in general slow in taking on inflammation.

DCCXXVIII]. These wounds, being attended with a destruction of the life of several parts, cannot heal by the first or second intention. The dead parts must be thrown off, so that the process of

216 of suppuration is necessary.

DCCXXX. The slough will be larger where the ball enters than where it goes out.

DCCXXXI. Gunshot wounds may be divided into simple & compound.

DCCXXXII. By simple, we mean where the ball passes through or into soft parts only, as muscles & integuments, and which are not attended with the effects enumerated in the following aphorism.

DCCXXXIII. The compound we subdivide into
1st - those in which a bone is fractured.

2^d - those attended with a division of some large artery.
3^d - Those penetrating some Cavity.

DCCXXXIV. The penetrating wounds (733. 3rd) are either
A. simple penetrating, or

B. - those also wounding some contained viscus.

DCCXXXV. When a ball passes thro a part, the most dependant orifice will heal sooner than the superior one.

DCCXXXVI. The healing of Gunshot wounds is always more slowly performed than the healing

of incised wounds.

DCCXXXVII. The degree of mischief done by gunshot wounds is not always to be ascertained early, because parts may suffer violence without any proof of the kind of injury appearing until sometime after the accident.

DCCXXXVIII. An artery may be so injured that a portion of it may become dead, yet the separation of the dead portion shall not take place at the time of the accident, but some time afterwards; so that tho' some ^{may occur} hemorrhage at the time the injury is rec^d, yet a violent one may come on when the dead portion of the artery sloughs away. - or

DCCXXXIX. A ball penetrating the abdominal cavity may bruise even to death, a portion of some gut, yet the cavity shall for the present remain entire, nor the exit of feces thro' its side take place, until the separation of the dead from the living part is effected.

DCCXXXX. Dilatation of gunshot wounds is not in general necessary, therefore not to be practised. The same indications, however, which require dilatations of other contused wounds may also direct us to enlarge these.

DCCXLI. Dilatation of the wound or even the removal of a portion of soft parts may be necessary

when a ball or any other foreign substance presses on any vital part, a large artery or a nerve. Likewise, in case a large artery is wounded or can be taken up; also when a part is displaced and can be restored by dilating in all cases, it is right to enlarge the wound.

As when a ball, bone, or any extravasated fluid presses on the brain we may remove a portion of the scalp to prepare for the trephine. As when the intestines come out thro' the wound and cannot be returned without dilating it.

DCCXLII. When a ball is lodged in a part, where its continuance may be the cause of danger, if we can extract, it is right to make dilatation.

DCCXLIII. It is wrong to dilate, simply because a ball is lodged in a fleshy part with a view to extract a ball where the circumstances similar to those (741. 742.) do not indicate the dilatation of the wound.

Balls, we know, often remain in parts for years without producing any inconvenience, and sometimes they are never found. With regard then simply to the ball being lodged in the body, the Surgeon need ^{not} be under much concern: he has only to take into consideration the other circumstances present, as the seat of the ball, the nature of the parts injured &c.

219. DCCXLIV. In simple gunshot wounds no advantage is gained by their dilatation, for the wound made by the knife of the Surgeon will heal much sooner than the wound made by the ball. So that dilating will not alter the nature of the wound or hasten the cure.

DCCXLV. Moreover if an extraneous body, as a ball, splinter of bone &c is to be thrown off, the wound thus dilated or heated in any other manner will not heal till the foreign matter is thrown off; so that all attempts towards a cure must be fruitless until that event takes place the wound will heal so as to leave a small hole only open, which will remain unhealed until all the extraneous matters, which are to be thrown off are come away.

Four Frenchmen were badly wounded by gunshot at Bellisle, two thro' the chest, one through the elbow, & the other through the deltoid muscle, scapula &c. All the patients did well without dilatation of their wounds. If the Surgeon makes dilatation the consequence is that the cure will remain unaccomplished equally as long as if nothing had been done. The superficial parts will heal to a very small hole and the deep seated ones remain open, so that a fistula will remain incurable until all the

dead or foreign matter is come away, as exfoliate of bone &c. Again, in gunshot wounds where the ball cannot be followed, as when it has entered the bones of the face, dilatation must be evidently useless. A reason given for dilatation has been the preventing or taking off inflammation & tension, but has not the incision made in dilating rather a tendency to induce these affections.

DCCXLVI. In examining gunshot wounds the probe should never be used where the fingers can be admitted: and forceps &c is never to be introduced but when a ball &c is within reach.

DCCXLVII. If a ball passes some way under the skin and again passes out at a considerable distance, an opening should be made midway between the two orifices to prevent the formation of an abscess.

DCCXLVIII. If a ball passes through immediately under the skin, the orifices not being far asunder, it may be right to open the sinus wound it has made its whole length; for the skin does not so readily unite with the parts underneath, as muscular parts do with each other.

DCCXLIX. If a ball is lodged under the skin

221 and can be felt, the integuments are bruised & threaten to slough away it may be right to incise the skin & extract it, for the mischief will not be increased by taking it out, and it will be giving satisfaction to the patient's mind.

DCCL. If the skin appears to remain sound & free from inflammation or disposition to slough, the immediate extraction of the ball is by no means necessary.

DCCL. The course of the ball will be often extremely irregular; it will vary from the perpendicular or horizontal direction to the oblique or tortuous; and sometimes its course will make a considerable section of a circle.

Balls that do not go through & through are generally spent balls, unless it happens that a ball strikes against a bone. A ball shall sometimes enter the breast obliquely, & afterwards go almost round the whole body and be directed by a rib until it pierces the skin & makes its way outwards. The cause of some balls is really surprising. Whistler has seen a ball enter on one side the skin bone, go across it & raise up the skin from the periosteum, and make its exit on the opposite side without doing any injury to the bone. Now had the ball

struck the patient with great velocity it must have gone directly across the bone & carried away a portion of it. A soldier had a ball enter the Deltoid muscle of the arm, & pass out under the scapulae close to the spine.

DCCLII. A red line appearing on the skin will in general mark the course of the ball.

It is difficult to say on what this red line depends, it seems to be neither the effects of inflammation nor extravasation.

DCCLIII. It is unnecessary to dilate a wound penetrating a cavity, as the abdomen or thorax, unless some other object requires the attention, than the simple penetration of the cavity.

DCCLIV. Compound Gunshot Wounds in which an artery is divided, or a bone fractured, as there is nothing specific in their nature, so general principles of surgery will apply to their treatment.

DCCLV. Penetrating wounds (p. 33. - 3) are divided into.

- a. - simple penetrating wounds.
- b. - Wounds penetrating some contained viscera.

The containing Cavities will be the abdomen, the thorax and the Cranium.

223 DCCLVI. Wounds simply penetrating the abdomen will in general do well, provided the first or second mode of union takes place so as to exclude the stimulus of imperfection from giving a general alarm to the whole cavity.

DCCLVII. Compound penetrating wounds of the abdomen will again divide themselves into two kinds,

1st those which penetrate some contained viscus, as the stomach, small intestines, large intestines, bladder &c

2^d those which penetrate some non-containing viscus as the liver, spleen &c.

DCCLVIII. The compound penetrating wounds (757-th) will have different symptoms according to the part receiving the injury.

DCCLIX. The symptoms of wounded viscera will be either,

1st immediate

2^d Secondary.

By the first is meant peculiar symptoms, arising immediately from the injury done to the viscera.

By the second, those which arise from the consequences of that injury, and not from the injury itself. —

224. DCCIX. The immediate symptoms of wounded stomach, will be, sickness, vomiting, great depression of mind &c

Of wounded intestines, bloody stools.
Liver, pain in the right or left shoulder according as the right or left lobe of the Liver is wounded, & discharge of pure blood by stool. —

Kidneys or bladder, bloody urine, where the ball if it remains unextracted may prove a nucleus for a future stone. Wounds of the Spleen will give no particular symptoms; it is in general followed by a profuse extravasation of blood into the cavity of the abdomen.

In general wounds of the Liver & Spleen will have none but immediate symptoms.

A young Gentleman rec^d two or three shots in his abdomen, one of which went thro' his body, entering before & coming out at his spine: his stools were natural from which Mr Hunter pronounced his bowels unhurt: his urine was bloody which shew'd either his kidneys or bladder to be wounded. He recover'd.

DCCIX]. It will however be very different in

225. wounded containing viscera, or those which naturally contain quantities of foreign or secreted matter as the stomach, the intestinal Canal, the bladder, the gall bladder &c. The intestinal canal being wounded considerable time may be elapsed before the separation of a slough gives an opportunity for the faeces to escape; these getting into the common cavity of the abdomen, at what distance of time soever from the injury, will become the cause of general inflammation of the cavity with all its consequences, as suppuration, gangrene & death.

A wound of the Gall bladder, Vesiculae Communis Chol; pancreas, or urinary bladder if communicating with the common cavity may produce the same effects, tho' probably more slowly. See ()

DCCLXII. In general wounds of the containing viscera will destroy the patient, but it sometimes happens that previous to the appearance of any secondary symptoms, adhesions shall take place between the wound in the intestines and the wound in the peritoneum and the common integuments, so that when the slough comes away, the faeces &c. will escape; but not into the cavity of the abdomen, but thro' the artificial canal formed by the adhesive inflammation; and which as an artificial

226. anus or urethra, will give an exit to the substances to be evacuated. When this circumstance takes place & no other ill symptoms forbidding us, we may offer a favourable prognostic.

A Gentleman in a duel had a ball passed thro' his belly: he had no particular ill symptoms for 13 days, on the 14th feces came thro' the wound & nothing further indicated mischief. Mr Hunter pronounced him out of danger, forming his prognosis on the principle laid down in the text

DCCLXIII. The time which may elapse before the secondary symptoms appear, may 10, 12 or 14 days (1762)

DCCLXIV. The artificial canal (1762) will sometimes close and heal up.

DCCLXV. Wounds simply penetrating the cavity of the thorax will be only so far dangerous as they may produce exposure to the thoracic cavity. If the first or second mode of union takes place before the alarm is given to the cavity, no mischief arises.

DCCLXVI. Wounds of the lungs are not always fatal, those made by a shot are more frequently destructive than those made by a sharp instrument, as a sword, or a bayonet &c. — for

227. DCCLXVII. The great cause of the mortality of wounds in the lungs being excessive hemorrhage into the cavity of the thorax. The hemorrhage following a gunshot wound will be much less than that produced by a cutting instrument.

DCCLXVIII. Symptoms of a wounded lung will be bleeding from the Larynx. Cough, pain in the side, fainting, difficulty of breathing, diminution of motion in the muscles of the thorax, the muscles of one side not acting without those of the other likewise.

DCCLXIX. The wound being in a vital part the pulse will grow quite hard.

DCCLXX. The patient will not lie in a horizontal posture, but is desirous of sitting erect that his diaphragm may be as freely expanded as possible.

DCCLXXI. A profuse extravasation of blood in the thoracic cavity may be judged of from the sense of weight complained of by the patient, from a slowness of pulse & faintness which must attend a sudden & copious evacuation from the lungs, & the common symptoms of a sudden accumulation of fluid in the thorax. ()

DCCLXXII. A gunshot wound penetrating the lungs, the wounded lung commonly collapses, & therefore an

adhesion of the wounded part to the place cannot take place.

DCCLXXIII. Gunshot wounds not healing without suppuration, room will be left for the matter which may be collected in the chest to drain off; but this will be attended with the inconvenience of making the thorax an exposed and imperfect cavity. If the quantity of blood extravasated is small it may be absorbed, but if there are symptoms of a large quantity being collected in that cavity, the operation for the Empyema should be performed as early as possible, because if the blood coagulates it will adhere to the sides of cavity, and not be got out without the greatest difficulty: or in some cases it may suppurate, or be lost to enlarge the original wound.

Penetrating wounds of the cavity of the head, will be considered among the diseases of the Encephalon (785.)

DCCLXXIV. Gunshot wounds may so far injure a part, that the process of restoration cannot take place in it, and therefore the wound is rendered incurable: in this case the removal of the part becomes necessary; and when a part, as the upper or lower limb has been so much injured that its removal is necessary, we must determine in what cases

amputation should be immediately performed: or in which it may be deferred to some future period.

DCCLXXV. Should a part (as an upper or lower extremity) be so far nearly separated from the body as only to hang by a small portion of soft parts, it may be immediately removed.

DCCLXXVI. Should a hemorrhage from some small vessel, which cannot be restrained, endanger the life of the patient, amputating the limb should be immediately performed.

DCCLXXVII. But in most ^{other} cases, it is advisable to defer the amputation until the inflammation is gone off.

DCCLXXVIII. If a cavity is wounded and any of the contained viscera protrude they should be immediately replaced.

DCCLXXIX. Bleeding is not indiscriminately to be had recourse to in gunshot wounds.

DCCLXXX. We are always to be directed in our opinion with respect to this evacuation: by the nature and situation of the parts injured: its powers of action: and the general strength of the patient in proportion to the general action of the vessels.

DCCLXXXI. Excessive bleedings having been performed, patients have sunk suddenly.

DCCLXXXII. The use of the bark becomes highly proper after inflammation has subsided, & even during the presence of inflammation if attended with weakness of the system. It is, however, necessary sometimes to accompany its use with small bleedings.

DCCLXXXIII. After the sloughs occasioned by gunshot wounds have been thrown off, the the ball or other extraneous body remains in the body, the ulcer will granulate & continue to heal so long as the extraneous matter remains quiet & does not stimulate.

DCCLXXXIV. When an extraneous body remains unre-moved, the ulcer may become fistulous, or a fistula may even be formed when the foreign body has been extracted, in which case it is to be treated as another fistula.

DCCLXXXV. Tauts are however always improper.

Diseases of the Brain.

DCCLXXXVI. Diseases of the brain are of two kinds viz. —

a. where the imagination is affected. from various causes, as in mania &c.

b. — from mechanical injuries

DCCLXXXVII. Mechanical injuries (786. b) may be either 1st Concussion 2^d Compression 3. wound.

231. or loss of substance. 4th Want of due compression.
DCCCLXXXVIII. The three first may exist separately,
or any two or all three together: their symptoms will
be nearly similar - a cessation of sensation, and voluntary
actions; the muscles of the mouth & throat becoming
flaccid; foeth being discharged from the mouth, with
the appearance of fullness of the vessels. The symptoms
of the 4th will be, restlessness & insensibility.

DCCCLXXXIX. Vomiting accompanies all these affections
of the brain, and arises from sympathy.

DCCXC. Vomiting, however, never takes place during
the time of perfect insensibility.

DCCXCI. Injuries done to the brain diminish sensibility.
Injuries of other parts increase it to a certain degree.

DCCXCII. Concussion (787. 1st) may depend upon a
displacement of parts of the brain. The degree of concussion
will be in proportion to the violence with which the
blow is given, whether the head falls against any
hard body, or any hard body is driven against the head.

DCCXCIII. Compression (787. 2^d) may follow accidental
violence immediately, or arise some time after.

DCCXCIV. Compression may be owing to any of the fol-
lowing causes,

- 1st to a depression of the skull from fracture
- 2^d to prepare of some part of the cranium from the thickening of a diseased bone.
- 3^d to water in the ventricles
- 4th to distention of the blood vessels,
- 5th to inflammation,
- 6th to the formation of pus
- 7th to extravasation of blood
- 8th to a tumour in the substance of the brain itself.

The causes of wounds or loss of substance in the brain must be sufficiently obvious.

DCXCV. Concussion will be either

- a. simple
- b. — compounded immediately, or
- c. — compounded secondarily.

DCXCVI. Simple concussion is when there is no fracture, compression or extravasation. We must endeavour to distinguish between concussion and the effects of intoxication. The effects of simple concussion will soon be carried off by plentiful bleeding &c. but if it is complicated with compression, the effects will not be diminished by time, but rather increased. Compression may instantaneously follow concussion, in which case it is said to be compounded immediately. Or compression may

236. arise when the effects of concussion would be naturally going off, in which case it is said to be compounded secondarily.

DCCXCVII. Fractures of the skull may always be considered as compound fractures; they are either made so by the Surgeon intentionally, or are found by him in that state.

DCCXCVIII. Fractures of the skull are of three kinds viz. —

1st Fracture of the outer plate,

2^d Fissure,

3^d Bone broken in several places,

These may be complicated with each other.

DCCXCIX. The 1st & 2^d (798) may be the remote cause of compression (793) and the third may itself become the immediate cause of pressure on the Brain.

DCCC. Bleeding from the nostrils, or ears, is a common, tho' an equivocal symptom of a fracture of the Cranium.

DCCCI. The concussion will in general be less where the bone is much shattered than otherwise, for the force being spent upon the skull, less shock is given to the brain. —

DCCCL. Gunshot wounds of the head (those made by other bodies moving with great velocity do not produce for the most part great concussions.

DCCIII. Fissures of the skull will run in very different directions along the cranium, across it, and even across the sutures.

DCCIV. If the skull is soft and yielding there will often be depression of bone without fracture.

DCCV. When there is fracture & depression of both tables if the fracture detaches an entire piece of bone from the undepressed cranium and that whole piece is driven downward, then the fracture of the internal table will always be larger than that of the external.

DCCVI. If the fractured bone is depressed on one edge only, and thro' both tables, the inner table will still go shelving off beyond the outer.

DCCVII. Hence (805. 806.) will appear the difficulty of elevating depressed portions of bone, so as ~~to~~ to make the separated pieces fit themselves to the undepressed cranium perfectly smooth - hence also the utility when a portion of bone is to be removed, to make the margin of the depressed piece a straight.

DCCVIII. The indication in all fractures of the skull is to prevent or remove pressure on a vital part, (i.e. the encephalon). Therefore it is necessary whenever there is a fracture with depression, when a piece is detached and driven inward to remove it entirely; or if one edge is depressed only to take care to ^{elevate} ~~remove~~

236. *it entirely properly.* The operation performed for the purpose of removing or elevating depressed bone, or for making an opening for any necessary purpose into the cranium, is called Trepanning, and the instrument used by surgeons for that purpose is called a Trephine.

DCCCIX. When a fracture is discovered it should in general be traced as far as possible throughout its extent, and therefore we are obliged to remove the scalp freely.

DCCCX. Fractures of the skull are so often complicated with the immediate or secondary symptoms of injured brain, that few cases will offer in which the Trephine will not be necessary.

DCCCXI. It is never necessary to apply the Trephine either in cases of fissure or fracture of the outer table only, unless there are also symptoms of an injured brain; & those not of simple concussion alone.

DCCCXII. In all cases of compression either immediate or secondary - of Concussion complicated with compression - and in all wounds of the brain it is necessary to apply the Trephine.

DCCCXIII. It may be sometimes impossible to ascertain the exact situation of the compressing matter, yet here, if the patient must undoubtedly die if not relieved, it is justifiable to operate at random.

DCCCIV. The situation of extravasated fluid will sometimes be opposite to the part where the blow was recd.

The situation of the extravasous will be very different in different cases, thence the great uncertainty of our relieving the patient who labours under compressions from some cause independant of depressed bone. It may be between the dura mater and the skull: between dura & pia mater: between the pia mater & the brain: or it may be in the ventricles of the brain, & even in the substance of the brain itself.

DCCCXV. The dura mater should never be divided unless from the greatest & most evident necessity (as when matter or blood is visibly lodged beneath it) for penetration of wounds of the dura mater (which exposes and renders imperfect a cavity containing the brain) will in general be mortal.

Mr Hunter computes that not more than one in twenty persons in health would recover from a penetrating wound in the dura mater.

DCCCXVI. The trephine must be applied in any part of the arch of the cranium where an accident may render it necessary or eligible. If the fracture is circular it will be right to repeat the application of the trephine until it is surrounded by the perforations.

238. DCCCXVII. As life consists in the properties of preservation and action, so death is the loss of both.

DCCCIX. The immediate cause of death in a part would appear in most cases to arise from a total loss of circulation, but this must be the effect of some remote cause.

In health we know the strength is always greater than the actions.

DCCCXX. Mortification of a part differs much from common universal death: in the latter case the vessels can be injected & the structure of the parts examined, but this is not the case with the former; its vessels cannot be injected; its structure is changed & is destroyed.

DCCCXXI. The immediate cause of mortification will be, whatever can excite the action of a part so as to render them superior to its strength; or reduce the strength of a part so as to be unequal to its actions.

DCCCXXII. Debility can be only the predisposing cause of mortification. It cannot immediately produce it, if a part is ever so weak while its actions do not exceed its strength, it will retain life.

DCCCXXIII. From (819) it is evident that a part may fall into mortification either with or without

previous inflammation: in the former case the inflammation is the immediate cause of death.

DCCCXXIV. Heat should be always in proportion to the living principle, otherwise it produces a necessity of exertion which the strength of a part is not equal to: the exciting of heat then in a part whose powers are extremely weak may induce mortification.

The greater the distance from the Heart, the more liable are parts to mortification.

DCCCXXV. When parts are extremely weakened, as in the principle of life by cold (as when people are frost-bitten) the application of heat must be gradual and slow, otherwise it will necessarily induce mortification. () As the principle of life increases the heat may be increased.

DCCCXXVI. From (819) we are enabled to discover why scarifications in the Legs of anasarcons patients, or wounds made in their extremities either by art or accident - why blisters applied to persons whose symptoms there is great debility & a disposition to putrefaction should be followed by mortification.

DCCCXXVII. Also why persons who have suffered severe famine, long exposure to intense cold, or extreme old age: or who have the circulation obstructed in a part:

240 or those of tall stature are subject to mortification, especially, of the feet & toes.

DCCCXXVIII. In the cure of mortification, or retreating parts falling into mortification, it must be evident that as the cause is diminution of powers in proportion to the actions of a part whether common or increased, so the cure must consist in lessening the actions, & in increasing the power of the part.

DCCCXXIX. Whatever then stimulates a part to action, without increasing its strength & powers must be contraindicated.

The temperature of the atmosphere in which patients to be cured of mortification are best placed, should be neither very hot nor very cold, that the natural actions may not be hurried on to fast.

DCCCXXX. Hence also it is evident, why bark should have so much power in checking some inflammations, and that opium may prove a very useful remedy.

DCCCXXXI. The causes (819) will be either
a. — mechanical as a blow, or
b. — chemical as a caustic

DCCCXXXII. The less vascular a part is, the more readily its life is destroyed.

DCCCXXXIII. Also, the weaker the powers of Life

in a part are, the more easily will they be acted upon by caustics.

DCCCXXXIV. The action of a caustic when applied to a part produces an abolition of its life, and then the caustic acts chemically upon its substance, coagulating its mucilaginous parts and changing its texture.

DCCCXXXV. No substance can act chemically but in solution: and in order for the caustic to act chemically it must be moistened, which is effected by the serum produced by the vesication which arises from the irritation caused by the application of the caustic substance, which serum moistens the substance and thus after the life of the part is unable to act for its preservation, operates chemically on the skin &c. —

DCCCXXXVI. Mortification, or the death of a part is often induced with a view to destroy a diseased, or even a sound part, in order to enable us to make application to some diseased part otherwise out of reach; or to give an exit to some foreign substance retained under the skin, as pus &c. —

DCCCXXXVII. The effects (834. &c) will be produced by a variety of substances artificially and

242. intentionally applied: of these the principle are
Caustic Alkalies
Concentrated Acids
Metallic Salts.

DCCCXXXVIII. Of the metallic Salts, Arsenic is the most powerful, whose action is different in some measure from that of the other caustics, as it produces mortification simply by its exciting violent action in parts, which they cannot support, and not by any chemical process.

DCCCXXXIX. The application of those substances to sentient parts is attended with violent pain, that is to be diminished.

1st by the administration of Opium by the stomach.
2^d by mixing opium with the substance to be applied.

3^d by applying plasters of Opium for some hours, to the parts, previous to the application of caustic.

DCCCXL. The natural sequel of mortification is a sloughing of the mortified part, or the process by which it is thrown off from the living parts.

DCCCXLI. To this process the suppurative inflammation of the living parts immediately in contact with the dead, & the ulcerative absorption of them is necessary.

DCCCXLIII. As in the exfoliation of bones, so in the sloughing of the soft parts, the absorption begins at the external edges of the dead parts; the dead part becomes dark coloured (Dory), the ulcerative absorption beginning at the edges & going thro' the whole surface of contact of the living with the dead parts; the slough is ultimately thrown off like any other extraneous body.

DCCCXLIII. As the weaker the part is the more readily it is acted upon by caustic, so the greater the strength of a part, the more readily the separation of the slough will go on.

DCCCXLIV. New formed parts being weaker than original, it is evident they will suffer their life to be much sooner destroyed by caustics.

DCCCXLV. From (844) we are enabled to learn why in new formed parts, mortification is so easily induced, as in large cicatrices &c.

DCCCXLVI. Also, why caustics so easily destroy the fungous excrescences of ulcers &c.

DCCCXLVII. In a mortification, no incision, ^{or wound} should be made into the living parts, at least until the process of suppuration is begun: a portion of the parts quite dead may however be removed at pleasure.

244 We know with some certainty how far the parts
of the body (the brain excepted,) and with what
comparative facility they go thro the process of sloughing,
the nearer the heart, ceteris paribus, the more readily
the process of separation will go on. The common
instruments will throw off a dead part sooner
than a tendon, ligament, or bone, as to the brain
it has not been ascertained whether it will slough
or not, for before the separation of the dead part can
possibly take place, the patient in general dies.
(See 846.)

Thus if a limb is mortified throughout its
substance, we may cut off a portion of the dead part
to lessen the stretch arising from so large a mass
of putrid matter, and render the patient's situation
more comfortable; but we must not proceed to
amputating the living parts, until a complete separa-
tion has taken place. (See 847).

DCCCXLVIII. Haemorrhages may arise either from
a wound made in an artery by external force, or by
such a state of weakness being produced in the coats
of the arteries themselves, as to render them incapable
of withstanding the impetus of the blood.

DCCCXLIX. When an artery in health is divided
there is a natural power of contractility in its coats
that disposes its orifice to close & prevent the further

245 escape of blood.

DCCCL. This contractile power is stronger in inverse proportion to the largeness of the artery. In the large vessels it is not equal to the business of restraining the hemorrhage, & therefore render the assistance of art necessary.

DCCCL. Another natural cause of restraining on hemorrhage and which we call the accidental is plugging up the mouth of the vessel by coagulable lymph.

DCCCL. Art is employed in restraining hemorrhage in three ways, 1st by increasing the contractile power of the arteries.

2^d by increasing coagulation, and thus plugging up the mouth of the vessel.

3^d by increasing the coagulation compression of the sides of the artery together near its mouth & thus rendering it impervious to the blood.

DCCCL. The first intention (852. 1st) we fulfill by the use of stimulants: and of these the most powerful is the oil of Turpentine.

DCCCL. The second intention (852. 2^d) by such remedies as will forward the natural, & produce an artificial, coagulation of the Animal juices.

DCCCL. This coagulation will be forwarded by the retardment of the blood's motion.

It is evident the artificial retardment of the

motion of the blood can only take place when the bleeding is from an extremity. We have sufficient testimonies of the use of the retardment of the blood motion in the stopping of hemorrhage, when we see people faint who have suffered great losses of blood, & that on the syncope taking place, the hemorrhage commonly ceases.

DCCCLVI. The substances forwarding a formation of the coagulum, are spongy bodies, as lint, fur, hair, flour, coals &c. &c.

DCCCLVII. The means productive of an artificial coagulation of the animal juices, are, the application of matters which act chemically upon them: such will be the actual counter, concentrated acids, boiling acids &c.

If the actual counter is used, the Iron should be very thick and nearly heated to red heat.

DCCCLVIII. The Mechanical means of stopping hemorrhage is by compression: this is made by rubbing the vessel near its orifice, in a ligature applied by the use, either of the Tenaculum, or the needle.

DCCCLIX. The tenaculum should only be used when we have found & unsplined arteries, & those not situated in the centre of a muscle, but loose in interstices of muscles & in the cellular membrane.

DCCCLX. The use of the needle is to be preferred where there is reason to suppose the artery is not

247. quite sound when it is situated in the middle of a muscle.

DCCCLXI. When the needle is used, a considerable portion of the circumjacent parts, as muscular flesh, cellular membrane, nerves &c. is commonly included with the artery in the Ligature, which gives additional support to the artery when weak or suspected to be unsound.

DCCCLXII. The degree of tightness to which the ligature is to be drawn will be in proportion to the size of the artery, and the quantity of surrounding parts enclosed in the Ligature.

DCCCLXIII. The ligature should be made thicker than is commonly done that a larger extent of surface of the Artery may be compressed.

DCCCLXIV. An accidental method of stopping hemorrhages, is, tearing the vessel asunder, for in contused wounds the bleeding of a vessel is less than in incised.

Of this the Miller's case whose arm was torn off by the wheel of a mill, at the articulation with the scapula, is an ample testimony. (See Cheseldons Anatomy)

So also the case of a person some time ago at the Middlesex Hospital.

The Farmers are sensible of this for they divide

248. the funis of their calves stands by tearing it in two. -

DCCCLXV. The disagreeable Sometimes fatal symptoms following the use of the needle where it is necessary to compress the sides of an Artery together, do not arise from irritation produced by a nerve being inclosed in a Ligature, but from some peculiarity in the constitution.

Of this Mr Hunter is satisfied, having several times tied his nerves with the artery two ill consequences superseded.

DCCCLXVI. It sometimes happens after tying an artery consequent on an accident or operation, that the artery shall bleed afresh after some distant time, as one, two, or three days, or even when granulation is going on. This mostly happens in the large vessels.

In St George's Hospital a boy's thigh was amputated for a disease of the knee joint. By repeated bleedings from the stump which always stopped spontaneously, the patient was so much reduced that at last he sank. Upon examining the limb after death, the artery appeared sound till within an inch of its termination in the extremity of the stump, where it was black, and had lost its elasticity.

The bleeding a new happens more frequently in the Radial or ulnar, than any other arteries. -

249. DCCCLXVII. When it arises within two or three days it commonly is owing to some circumstances attending the operation, as tying the ligature too loosely, or too tight.

DCCCLXVIII. When this is not the case (867) and when bleeding happens after granulation (866) has taken place, it may be attributed to a diseased state of the artery.

DCCCLXIX. The artery should be laid bare (if possible) until the sound part comes in view, & then a ligature sh^d be placed.

DCCCLXX. In some patients when granulation has taken place after a wound, or when a considerable surface is stripped of its integuments (as after Amputation of a thigh) there will be a profuse bleeding from every point of the exposed surface.

DCCCLXXI. This will occur in patients who are extremely debilitated & whose vessels (even the smallest) want the power of contraction.

DCCCLXXII. The term spurious Aneurism has been improperly applied to an extravasation of blood in the cellular substance which blood has escaped from a puncture in the coats of an artery.

DCCCLXXIII. This may be either recent or not-recent. In both there will in general be a necessity for performing the operation of the Aneurism.

250 DCCCLXXIV. In this case as there is a lateral wound in the Artery, the escape of the blood will continue to go on because the Artery cannot contract itself longitudinally; and was it to contract circular there would be an obliteration.

DCCCLXXV. Therefore, there will be no natural cure for the accident, & it must either kill or the operation be performed.

DCCCLXXVI. In the non-recent spurious aneurism the wound in the skin is healed, the cellular substance is thickened, and with some coagulation of blood formed a cyst into which blood from the unclosed wound in the artery is continually effused, & this must ultimately burst & destroy the patient unless the operation for the Aneurism is previously performed.

The thickening of the cellular membrane round the artery, and its being lined with tough coagulum, will make this complaint resume the real aneurism, but in the latter the coats of the artery are always forming the cyst; in the former the coats of the artery are never dilated.

DCCCLXXVII. To this state (872) the recent spurious aneurism must always proceed, unless it either destroy the patient or the operation is speedily performed.

DCCCLXXVIII. The arteries are subject to two diseases, ossification & weakness; the latter will be the predisposed

cause of a dilatation of the coats of an artery to which alone the name of Aneurism should be given.

DCCCLXXIX. The immediate cause of Aneurism is a want of balance between the force of the Blood's motion and the power of resistance in the artery.

DCCCLXXX. Accidents, as some violent exertion of muscular power may give rise to it, but it more commonly depends entirely upon some diseased state of the coats of the artery.

DCCCLXXXI. This is more probable, because it is not unusual to find several Aneurisms in the same person, from which it should appear that the disease is a weakness and disposition to dilatation in the arterial system.

DCCCLXXXII. Moreover the common seat of the Aneurism is in the large Arteries whose coats are less muscular than those of the smaller.

DCCCLXXXIII. An aneurism we believe never takes place from a rupture or wound of some of the coats of an artery, & a dilatation of the rest.

This has been supposed to happen & has been called the mixed Aneurism: but from experiments similar to the following the conclusion is to be made.

Mr Hunter laid bare the Carotid Artery of a Dog, and afterward thinned it with his Knife even to

252. Transparency: no dilatation of the vessel ensued. Three weeks afterwards the animal was killed & the artery on which the experiment was made, was not found in the least dilated, but thickened by the adhesive inflammation, and the adhesion of the adjacent cellular substance.

DCCCLXXXIV. The dilatation of one artery will always be to that side on which there is the least resistance from the surrounding parts; if there is no resistance on either side, it will then be in that direction in which the blood is most forcibly thrown: if these circumstances are equal on all sides it is uncertain in what direction the dilatation will be made.

In the arch of the Aorta if an aneurism takes place the dilatation will be upwards.

In the carotid artery	— — — — —	outwards.
In the abdomen	— — — — —	forwards.
In the Viscera.	— — — — —	downwards
In the Ham	— — — — —	backwards
In the Groin	— — — — —	forwards
In the Leg.	— — — — —	uncertain.

Hence absorption of bone so often rises from its making pressure against them.

The artery will continue to swell in that direction in which it first began to thinify, and the lower parts will be dilated more than the upper. —

253. DCCCLXXXV. The natural tendency of the disease is to destroy life: this is effected either by the tumor bursting and the patient dying of the hemorrhage, or by its enlargement so as to press upon some parts, essential to life, & hinder their functions.

It may suffocate by pressing on the Trachea, if the Aorta or the carotis is the seat of the disease. Its pressure on the returning vessels may occasion dropsy &c.

If the aorta in the abdomen is the diseased part, it may burst inwardly, or if it produces absorption of the bones of the spine it may swell outwardly & at length the skin inflaming & bursting & the coats of the artery undergoing the same change, the coagulum gives way & a fatal hemorrhage ensues.

DCCCLXXXVI. When the operation for the Aneurism is proper, it should always be performed as early as possible: this rule will extend to spurious aneurism.

DCCCLXXXVII. The operation is proper.

1st When the dilated artery can be included between the ligatures.

2^d When there is a probability that the parts to whose support the artery in question was subservient heretofore, will be still nourished & supplied with blood.

3^d When it has done no mischief to surrounding parts, as bones &c.

4th When it is distinct and circumscribed,

254. not connected with parts which may be incurable
when exposed, as bone &c
5^{ly} When there is a distinct pulsation in the
tumor.

6^{ly} When it is probable that there is no other
Aneurysm between it & the heart.

By the first rule, of course, all the Aneurysms
of internal parts are excluded from the operation.
As to rule 2^o the only arteries admitting of a
question, will be the femoral & the brachial, but
success here is only to be doubted of, yet by no means
improbable; the other arteries are either out of the
way or have free

The aneurysm of the interosseal, anterior & posterior
tibial arteries, the operation cannot take place from
the difficulty of taking up these vessels, therefore recourse
must be had to amputation &c also when a diseased state
of the bones &c many part is induced by a pressure of the tumor.
On the whole this aphorism will allow of the
operation, if rule 3^o 4th & 5th permit it in the following arteries.

In the Carotid above the Sternum.

In any of the branches of the external carotid

In the Subclavian when it has passed the Scaleni
muscles, & in any of its branches.

In the axillary after it has given off the profunda.

In the popliteal.

Directions for the Operation.

1st When the Tourniquet can be applied between the Aneurism and the heart, after putting it on, make a longitudinal Incision in the course of the Artery thro' the Integuments &c to a greater extent than that of the tumor; then cut into the Aneurism and scoop out the coagulated blood, as well as evacuate that which is fluid. The inferior orifice will most readily be discovered as it will throw out some little blood of a venous colour: to discover the superior the tourniquet should be slackened.

2^o Tie the artery about an Inch at least above the superior orifice. the same caution is ^{not} necessary respecting the inferior. When the tourniquet cannot be applied the ligature must be passed both above & below the tumor before the incision into it is made; it is then to be laid open throughout its extent.

The sac need not be cut out, but left to slough away. The dark colour of the blood issuing from the inferior orifice is caused by the blood taking on a slow retrograde motion which is explained by the annexed diagram.

For blood by having a slow motion, or by stagnating, will even in the arteries acquire a dark hue; the older the aneurism, the more will the coagulum

256. approach to a brown colour; & the more recent the nearer will it be to the natural colour of arterial blood.

When an Aneurism forms, the cellular substance thickens round it, but being elastic readily yields to distention.

Aneurismal Cases.

1st. A young man had a pain in the calf of his leg for two years, at length he received a blow on the ham, after which a pulsation and swelling soon appeared. The operation was performed: every thing went on well to the 5th day, when the artery burst, either from the upper ligature being applied too tight, or too low. Before the tourniquet could be applied he lost so much blood as occasioned his death. Upon dissection the artery was found perfectly sound above the part where the ligature was made.

2^d. An Aneurism of the Crural Artery in the middle of the thigh extended 5 or 6 inches in length; the tumor being oblong. The operation was performed, and the patient in a short time recovered.

3^d Mr Martin had an Aneurism in the popliteal artery: the operation was performed, and he recovered the use of his limb so perfectly, as to be able to dance &c. —

Remarks on the propriety of operating for
the aneurism of the Popliteal Artery in preference to amputation.

Whatever objections are made to the operation,
the same must hold good also against amputation of
the Limb.

That the disease, being most commonly a disease of
the arterial system, is so much insisted upon, not of the
part in question only if true, militates equally against
amputation as against the operation.

V If there is not only an Aneurism in the Vein but
another higher up, as in the artery, or in the Aorta, it is
evident that amputation of the Limb does not give the
patient a greater chance of his life than tying the artery.
It is not uncommon, perhaps most commonly it happens,
whatever may be the general disposition of the Arterial
System, that the actual dilatation shall only have taken
place in one part: now if tying up & removing the
diseased part can be accomplished, the patient still
retaining the use of his Limb, it is certain that the operation
must be highly preferable to amputation, as the
latter though it preserves the patient's life, yet leaves
him imperfect & mutilated.

DCCCLXXXVIII. In our treatment of fresh wounds it
may be considered.

- 1st The nature of the part wounded.
- 2^d The management of an Hemorrhage should one arise.

3^d When the first or second mode of union is to be desired, or whether suppuration is indicated.

DCCCLXXXIX. If the diseased parts are to be united by the first mode of union, the indication will be to bring them into contact & retain them so. This will be fulfilled by means of bandages & in some cases sutures.

DCCXC. But when a part is to inflame & suppurate it is better to defer the application of bandage until after inflammation has subsided.

In treating of Gunshot wounds it is observed that contused & lacerated wounds will not heal without suppuration. In wounds penetrating cavities, if the wounds are made to heal without inflammation and suppuration, it is then similar to any other simple wound, but if the suppurative inflammation is to take place, it will be requisite to advert to the doctrine of exposure of cavities and of penetrating Gunshot wounds.

It must be evident also, that if extraneous bodies are introduced into the cavity either by accident or intention, and not removed, the suppurative inflammation will be necessary.

DCCCXCI. Whenever a wound is to go thro' the

adhesive or suppurative inflammation, it is generally improper to use applications which will adhere to the wounded surface, as becoming dry, they cannot be removed at the pleasure of the Surgeon, — hence the use of dry lint is extremely improper, But if the substance to be employed is somewhat soft & moist, has no continuity of parts & which can be with ease removed upon any occasion, it can do no injury.

A poultice answers the description, and the best manner of preparing it is to pour boiling water upon lined meal, and add as much oil or hog's lard as will keep it from drying. But poultices cannot universally be had recourse to, and instead of them we use lint dipped in olive oil.

DCCCXCII. When a wound has suppurated and granulations are arising, if they do not readily contract, so as by the contraction to forward the formation of a cicatrix, it will be proper to apply the pressure of a bandage.

DCCCXCIII. Abscess will be either sound or unsound, By the former we understand abscesses arising in healthy constitutions in parts which have a power of healing & unconnected with any specific disease. By the latter, we understand abscesses arising in an unhealthy constitutions, or from some specific disease. —

260. DCCCXCIV. The nature & treatment of sound abscesses will be readily understood from considering the doctrine of the adhesive & suppurative inflammation.

DCCCXCV. The evacuation of the matter contained in an abscess is either obtained by the abscess bursting of itself, or by an artificial opening. Abscesses may be suffered to burst, unless some particular circumstances require an artificial opening.

DCCCXCVI. The circumstances most generally requiring an artificial opening, is the danger arising from the long retention of the matter.

DCCCXCVII. All abscesses of the abdomen, thorax, brain, eye, and joints should be opened artificially & early.

DCCCXCVIII. When an abscess is opened artificially it will in general be necessary that the opening be large to prevent the future inconvenience of a fistula.

DCCCXCIX. When an incision is made into an abscess, the wound should be so dressed as to prevent the reunion of the incised parts by the first or second mode of union.

DCCCC. There are two methods of opening an abscess
viz.

a. by caustic,

b. by incision.

Where no particular circumstances (as the seat of the abscess) forbid, the choice may be left to the patient.

DECEC1. Another circumstance indicating the artificial opening of an abscess will be, its being of such a magnitude, that the natural opening will not be sufficient for the discharge of the matter.

DECECII. In determining the size of our opening it is necessary to have a regard to the present distention & future contraction of the Integuments.

If the magnitude of the abscess has produced only simple distention without considerable absorption (ulceration or interstitial) of the parts on which it is seated, it is not necessary to make a very large opening, because when the distending fluid is removed the parts will immediately contract themselves, and recovering their original situation, the cavity will become obliterated.

But if the cavity has been made by ulceration & absorption of the parts in which the matter was contained, & not by simple distention of the surrounding parts, then it will be necessary to make a large and free opening to prevent the inconvenience of a succeeding fistula, because here the parts cannot contract themselves to obliterate the cavity, but the cure must be accomplished by granulations. (See Fistula).

DECECIII. The living principle will always be uneasy under extensive exposure, and will therefore be powerfully excited to action, — hence large

262. openings in abscesses, where the contraction of the parts is not sufficient for the obliteration of the cavity. & consequently for the cure, are always useful, because they are the means of exciting the process of restoration.

DCCCCIV. Abscesses may be free from any specific disease, may arise in an healthy constitution, & yet certain circumstances may retard their healing.

DCCCCV. These may be

- 1st Peculiarities of situation ^{near}
- 2^d The stimulus of some deep-seated body, as a ball, splinter of bone &c.

The first causes of backwardness to heal, we cannot alter.

The second causes we must wait for the removal of, before we can hope for the healing of the abscess.

DCCCCVI. When sores of any kind have a disposition to heal, the surgeon has little to do, except to prevent any obstacles arising that may hinder the process of restoration.

DCCCCVII. If dry lint is used to heal sores, it sh^d be applied so as not to extend quite to their margins. If ointments are used, they sh^d be free from stimulus.

DCCCCVIII. Amongst the obstacles to the healing of a sore will be.

Intemperance
Neglect of rest, and

The granulations arising too high above the surface of the sound skin.

Decccxix. The latter obstacle is to be removed by pressure, as that of a bandage, and by touching the granulations with some metallic salt, as vitriol of copper, Lunar caustic &c.

Decccx. New formed parts being weaker than original parts, are less able to support the fatigues of the offices of life than the latter. — hence when a slight stimulus is applied, they readily inflame & if that inflammation is not removed, the suppurative & ulcerative stages come on rapidly, or mortification speedily takes place.

Decccx. The absorption of new formed parts may be either.

- a. — Ulcerative, or
- b. — interstitial

Decccxii. The tendons of muscles are sometimes ruptured, and this accident happens similar to those of a broken patella, the muscle being in violent action at the same time that there is an unconquerable resistance made by the point to which the tendon is attached.

This will be illustrated by considering the rupture of the Tendo Achilles. It is generally

effected when the muscle of the leg becomes tired and unfit for voluntary motion, at after long continued dancing &c, and therefore the muscle will act involuntarily - Hence the cramp &c. By this violent involuntary action they rupture the Tendo Achillis. In doing this the patient feels little or no pain in the part, but seems to receive a blow on the Gastrocnemius muscle, & hears a noise, as of some elastic body snapping in two. Inflammation ~~of~~ may succeed. The muscles may be squeezed out & the ends of the tendon approximated together, and as much as possible be retained in that situation. When these symptoms are removed no inconvenience will arise from suffering the patient to walk, for there is no danger of the Will throwing the muscles into action, and thereby producing a further separation of the divided ends of the Tendon; for the will cannot now act upon the muscle. An involuntary action of the muscle may take place, especially during sleep, which is to be guarded against by placing a tight bandage round the calf of the leg, and making the patient wear a high-heeled slipper or sandal.

The bandage & sandal are more particularly necessary by night & while the patient sleeps. During the day time their use may commonly be dispensed

with. From the back of the sandal a piece of leather is to be carried & fixed to the bandage, & a leather strap placed tight round on the calf. When the rupture happens no bandage should be applied.

The patient will find little amendment during the first two months, but will after that period generally recover the use of his limb. Keep the foot nearly at a right angle with the Leg: the heel a little raised: when the patient walks he should turn his toe outwards & not attempt to bend his knee.

The ankle & foot will commonly swell considerably. About 3 weeks from the accident the roller & stopper may be left off. It may be asked, when may the patient attempt to use the muscles? It is answered whenever he feels a consciousness of power to use them.

Mr Hunter broke his Tendo Achillis in dancing. He is not clear whether cramp of the muscles precedes the snapping of the Tendon, but it certainly immediately follows it.

DCCCCXIII. In order to cure this accident the indications will be,

1st To place the divided ends of the Tendon as nearly as possible to the natural situation

2^d - To take off or prevent inflammation

3^d To prevent the involuntary acts of the muscles.

When the tendon is ruptured the muscle will retract itself & remain so until art attes its position therefore it should be lengthened out by squeezing.

DECCCXIV. It is necessary to forbid voluntary action of the muscles because in the present state it will no longer be subservient to the will.

DECCCXV. Should the divided ends of the Tendon not be brought into contact, but remain at some distance asunder, the union will be accomplished by a new formed substance & therefore the tendon somewhat lengthened: the muscle will however, be shortened. Its power of contraction lessened. No inconvenience will ultimately take place, for the muscle (as in the cases of fracture of the patella Volcanaron) will acquire new powers of contracting adapted to its necessities.

DECCCXVI. In wounds connected with joints it is necessary to pay great attention to the joint during the cure: if there has been loss of substance without great care on the part of the surgeon, rigidity & loss of motion will be the events.

The motions of the shoulder joint are more difficult to restore after any wound or considerable injury of that joint because to some of them the gravity of the arm is an obstacle. Were it possible to heal a wound of the shoulder joint with the arm elevated, then the motions would be as

267. easily restored as those of other joints.

DCCCCXVII. After the inflammation has entirely subsided and the cure is somewhat advanced, the joint should be gradually moved by the Surgeon from time to time, that the vitiated matter may be elongated in a manner similar to elongation of the coagulable lymph in adhesions between the Lungs & pleura.--

End

of
Part the Second.

Rationale of Surgery.

Part the Third.

p 59.

We come now to treat of those affections of the body which are the object of Surgery that may be more properly called Diseases: (i.e.) those affections in which parts have no disposition for restoration, but only a disposition to destruction; and which disposition will continue to exist until either it hath worn itself out, or has destroyed the patient, or is cured by art. In short those affections for which there is no natural cure.

Inflammations whether arising spontaneously or from external violence, suppurations, &c and all accidents (unless so much mischief is done either to a vital part, or to the constitution, that the functions cannot go on) becomes themselves the causes of restoration. These we have already enquired into so far as concerns the principle on which their different phenomena depend, & have also considered the particular attentions by which we shall facilitate

the process of healing, in which, in fact, little is to be done, except removing all impediments to the natural cure. But in diseases the present disposition is to be removed, and a new one induced in its stead.

It has been shewn, that as Irritation in health induces disease, () so irritation on disease is to bring back health. The Aphorism generally holds good, though in some cases of diseased irritability an objection may be made to it.

After some previous general remarks on indolence, we come to particular diseases originating from that cause. Tumors are there spoken of, but those only which originate from indolence are there meant to be explained. The definition given of them indeed will apply to other causes than indolence, as inflammation &c. but the subsequent remarks will shew that Mr. Hunter when speaking of tumors in that place had it only in view to treat of indolent swellings.

DECCXXVII. Diseases, or unsound dispositions will be properly divided into the irritable or the indolent or those in which there is a disposition to too great or to too little action.

DCCCCXIX. Either of these dispositions will be an hindrance to restitution of health & must be changed before health can be restored.

DCCCCXX. It is easier to increase the disposition of a part to act (in general) than to abate it.

DCCCCXXI. In the indolent diseased disposition there is neither sufficient power, nor sufficient excitement to action. In the irritable there is too great excitement without corresponding powers.

DCCCCXXII. Again; in diseased irritability, parts are impatient under any removal from a state of perfection, yet have no disposition to set about the process of restoration. This disposition may be either simple or connected with more specific disease as Syphilis. Cancer &c.

DCCCCXXIII. When simple we must have respect to the principle laid down, () but when complicated with some specific disease, both the specific and the irritable disposition require attention.

DCCCCXXIV. Diseased irritability may be local or it may be a state of the constitution at large.

DCCCCXXV. It appears in general to be passive, requiring the application of some stimulus to bring it into action. —

24/
DCCCCXXVI. An increased degree of sensibility will generally accompany diseased irritability, the living & sensitive principle commonly sympathizing.

DCCCCXXVII. Inflammations with diseased irritability should not be hurried on to suppuration, nor on the contrary should those means be used which lessen their powers, the indication being simply to lessen violence of action, not to diminish power. Opium may be properly used in solution or mixed with some emollient poultice. For preparations of lead, see ()

DCCCCXXVIII. The diseased irritability of the constitution is lessened by the use of bark & those means which increase the strength.

DCCCCXXIX. When a suppuration has taken place in parts under this state, & an opening is to be made to discharge the matter, a caustic is to be employed in preference to the knife; for an incision has not here, in general, such favourable consequences as the other method.

Caustics are not followed by so speedy and extensive an inflammation as the knife. An incised wound in such circumstances has frequently for its sequel, an erysipelatous inflammation.

DCCCCXXX. Ulcers have sometimes a diseased irritability, and when this is the case the dressings should in general be of the mildest kind.

272 DCCCCXXI. We cannot, a priori, always determine what application will assuage the pain & other symptoms; we must therefore change our dressings until we meet with one fulfilling that intention.

Some ulcers will shew every sign of the greatest irritability, as pain &c, will have their symptoms relieved and often increased by mild dressings, but will grow easy under the use of the most powerful stimulants as Ol Turbithum. But we ~~also~~ first try poultices with opium &c.

DCCCCXXII. The unsound disposition or the indolence, or the diseased indolent, may be either ~~the~~ an affection of the constitution, or a part. The constitution will rarely be indolent in a great measure.

We meet with few constitutions which will not readily take on inflammation, a stimulus being applied to any part of the body in which there is no particular local affection. How far constitutional indolence may prevail, we have a proof in scrofula.

DCCCCXXIII. Specific diseases may give rise to or accompany indolence in parts, as syphilis, the scrofula & sometimes the Gout.

DCCCCXXIV. The common effects of indolence in parts is a thickening of them: the process of restoration of parts in a state of indolence is extremely slow. —

DECCXXXV. As the extent & spreading of disease in diseased parts is great & rapid, so the disease of parts in a state of indolence is in general very circumscribed and rarely spreads to any considerable extent.

DECCXXXVI. The thickening or swelling of parts morbidly indolent is of two kinds. viz.

1st Interstitial

2^d Superadded.

Indolent swellings commonly go on to a considerable degree before any knowledge of them is communicated to the mind; but when very far advanced some dull, heavy pain, with sickness will be produced. This probably arises from the distention of the surrounding parts.

DECCXXXVII. The causes of indolent disposition arising in parts are

- 1st The long cont. action of cold.
- 2^d Violent actions terminating in Weakness.
- 3^d Pressure from mechanical causes.

Indolence may be also spontaneously arising without any sensible or known cause.

DECCXXXVIII. The first species (936. or interstitial

274. thickening, is that in which no new or distinct parts are formed, but there is simply a swelling or enlargement of the original parts, as a corn, varices of veins &c.

DCCCXXXIX. The second (936) or diseased indurated parts superadded, is that in which new parts are actually formed, distinct from the old.

DCCXL. The intentions of cure will be to increase both action & power. In the interstitial thickening, as the swelling, generally consists in the deposition of coagulable lymph in the cellular substance. To produce a re-absorption of it we must employ those means which increase the action of the absorbents, as mercury, prepone applied so as to stimulate, fomentations &c. Care, however, is to be taken, not to excite the parts to greater action, than they can bear, lest mortification should ensue.

DCCCCLI. When the thickening cannot be removed by absorption (940) stimulating applications may produce a cure by exciting the suppurative inflammation in them. Their suppuration is, however, with difficulty brought about, and when it has taken place, and ulceration followed it, the cure is not always easily obtained.

DCCCXLII. Abscesses have been divided into

275 Sound & unsound. Of sound abscesses an account has been given; of those which are unsound, & in which there is a disposition of indolence, it will be better to speak when their common cause and consequences, Scrophulous & Tertiary, come under consideration.

DCCCCXIII. Ulcers or sores may have an indolent disposition, & thence a backwardness to heal; when simple indolence is the cause we have recourse to those means which will excite the parts to action, as Turpentine, Balsam &c.

DCCCCXIV. Corns are an instance of indolence from pressure; the cuticle thickens from the stimulus of necessity, and as it increases in thickness presses on the skin & produces uneasiness & pain.

The cure of corns consists in obtaining a separation from the cuticle, which may be brought about rather by leaving off the pressure, soaking the part often in warm water & keeping it always moist & defended by some (preparation) proper plaster or by removing it at once. When the corn has been of long standing it is often difficult to move by excision as a wound of the parts underneath is sometimes followed by inflammation, & even gangrene. But we may attempt it by removing the pressure, soaking

276. the part long in warm water, then applying a blister to obtain a separation of the cuticle from the Cutis.

DCCCCXLV. Varicose veins are also an indolent thickening from pressure. If the disease is not too extensive & the operation too hazardous they may be dissected out, & the inconvenience they removed.

DCCCCXLVI. Chilblains may be given as an instance of indolent thickening from cold, though they have in them at first something of an increasing virility. The constitution most disposed to this kind of indolent thickening are the delicate & such as have but small powers of generating heat.

DCCCCXLVII. Schirrus of a gland may be offered as an example of violent action terminating in weakness, and acting as the of an indolent thickening.

DCCCCXLVIII. Of the spontaneous indolence (937) puffs may be given, in the swelling of the legs so common in Barbadoes, & sometimes seen in this country, and in the swelling of the lymphatic glands.

DCCCCXLIX. Some indolent swellings may require extirpation, as in increasing their action in order to suppuration, they may be made to burn out cancerous. —

277. DCCCL. Lymphatic glands may go slowly, gradually & indolently into tumefaction until they have become of a size which may render extirpation necessary, from then making pressure on some important part, & disturbing its economy, or from their occasioning deformity.

Of this kind are those swellings of the inguinal glands which have so often been mistaken for venereal & for which people have even been salivated. Sometimes these enlarged glands are so situated that extirpation is difficult & not to be undertaken without the greatest caution. This will be spoken of when we come to tumours & scrofula, to which two articles they belong.

DCCCL. I. Wherever a cure can be obtained, ~~we~~ ^{the} ~~should endeavour to ascertain whether they arise~~ indication will be the same, either to increase the action of the absorbents, or to remove the part entirely.

DCCCL. II. In all indolent thickenings we should endeavour to ascertain whether they arise from the constitution, or whether they are purely local. (See Constitutions local & generally local.)

DCCCL. III. Indolent swellings of parts will be either circumscribed or diffused. By the former we understand

278. a tumor (954). The latter we mean when we speak of thickening of parts.

When we speak of indolent swellings being diffused, we only speak as comparing them to tumors, for indolent thickenings compared to swelling of parts from other causes are generally circumscribed.

DCCCCLIV. By the term Tumor, we mean a circumscribed substance produced by disease & differing in its nature & consistence from the surrounding parts.

DCCCCLV. Tumors may be divided into

- a. Solid
- b. the encysted.

DCCCCLVI. The solid (955) may be subdivided into three. viz

- 1st The interstitial
- 2^d The superadded, or new formed substances.
- 3^d The mixed.

DCCCCLVII. The first or interstitial (936) belongs to scrofula. — The second or superadded, are entirely new formed substances: they take their rise from some fixed point, from which they grow as from a root which will be of different sizes. They are perfectly circumscribed; are generally ^{more} detached than a lymphatic gland & they have no coat.

The third, or mixed, consists of those tumours called *Wens* & *Schini*, in which there is a mixture both of enlarged original, & of new formed parts.

DCCCLVIII. These differ very much in their appearance & consistence; sometimes being only fatty tumours; sometimes almost cartilaginous: when cut thro' they somewhat resemble a divided lemon.

DCCCLIX. The 2^d & 3^d will rarely, if ever admit of any other treatment in order to a cure, than extirpation.

DCCCLX. Previous to the extirpation of any tumor it is necessary that we enquire,

1st What part it adheres to, or is connected with & its situation.

2^d The manner in which it ought to be extirpated.

3^d whether it is necessary to remove any of the surrounding parts with it.

DCCCLXI. The second species () may be of different degrees of hardness; may grow from a bone & the bony, from a tendon and be of a ligamentous form &c.

DCCCLXII. They may also be adherent to the skin to a muscle &c and they may be either superficial

280. or deep-seated.

DCCCLXIII. The third may also be loose under the skin, or they may adhere to the skin: they may be seated superficially or deep, upon a bone, muscle, large blood vessel &c.

DCCCLXIV. If the surrounding parts are not diseased they may be suffered to remain, - if diseased they must be removed as far as the disease extends, for it should be a rule to move the whole of the disease.

DCCCLXV. If a tumor is loose and does not adhere to the skin, a longitudinal or crucial incision, according as it is large or small, deep-seated, or superficial, may be sufficient & then the tumor may raised from its bed & removed.

DCCCLXVI. But if it is adherent to the skin, then a portion of the integuments must also be removed, at least as large as the adhesion extends.

DCCCLXVII. If it springs from a root originating from a bone, it is to be removed by the saw, pinches or chisel. In this case it may also be necessary to cauterize that part of the bone from which it originated.

A young lady had a tumor situated on the lower jaw; it became hard & almost bony. Mr. Hunter pared it away even to the surface of the

281. jaw bone, but it rose again. When it had been pared off a second time, and the maxilla canterized, the patient got well. The tumor consisted of a thin plate of bone forming a shell, which contained a cartilaginous substance.

A young woman had cartilaginous excrescences growing from the upper jaw, after the extraction of a tooth they were removed, but grew again; after being the second time extirpated the patient got well. These seem to occur most frequently on the jaw bone, or on the tibia.

In the third or mixed, calcareous earth is sometimes deposited: they not unusually fall into a kind of suppuration, without the surrounding parts being affected. In removing them great caution is sometimes required. Mr Hunter has dissected them off the temporal & carotid Arteries, and once laid the trachea they have.

DCCCCLXVIII. If it is situated on any large blood-vessel & great care will be required in the dissection of it from its seat. (See note 967)

DCCCCLXIX. If it be only a fatty tumor not adhering and of a small size, a simple incision down to it will be found sufficient, and then the

282. Surgeon may squeeze it from its bed with his fingers.

DCCCLXX. When the third or mixed very much enlarges, they are frequently productive of pain, which, however, is not acute: it is of a dull heavy kind & it depends on pressure upon parts more sensible. The stomach sympathises with the affection, and sickness is not unusually a circumstance.

DCCCLXXI. As is the pain, so likewise is the inflammation when it arises, of surrounding parts: these however are seldom much thickened.

DCCCLXXII. As to endeavour to induce ⁱⁿ these tumors the suppurative inflammation, the opinion given () will here be applicable.

DCCCLXXIII. The encysted tumors are substances contained in a coat which is either natural or acquired.

DCCCLXXIV. The natural are the Hydracele, Dropsy of the Ovaria, pericardium, sacculi mucosae in which the ~~constitution~~ contents are enclosed in a natural bag.

DCCCLXXV. The contents of encysted tumors whose tunica is acquired, will be various in their consistence & nature. Hydratic form a considerable class

DCCCLXXVI. Hydatids are collections of watery fluid enclosed in an adventitious bag. We do not know the nature, cause, or manner of their formation.

DCCCLXXVII. Every part of the body where there is cellular substance becomes the seat of Hydatids, but more commonly the plexus choroides of the brain: the tunica vaginalis Testis forming a kind of ^{Spurious} hydatid.

DCCCLXXVIII. They are of different sizes, but they enlarge their coats thicken & become stronger. Their coats are but little vascular. Sometimes one large Hydatid will contain several smaller ones, one within another. They are often found in the Uterus, the Kidneys, the Liver, the Thyroid gland, the Lungs &c. but how formed is unknown.

Hydatids.

It is difficult to explain the manner in which they are formed, or to determine which are formed first, the exterior or the interior ones. Are they not animals of the polypous kind?

Remarks on particular Hydatids.

Hydatids of the brain are sometimes found, and usually on the plexus Choroides. Their occasion is

284. symptoms peculiar to themselves, and from their situation can admit of no cure.

Uterus & Ovaria.

The fluid contained within the hydatid found in those places is sometimes of a gelatinous nature: they are more detached at first than afterwards. Sometimes increase to an enormous size occupying greatest part of the abdominal cavity, and is then called an encysted dropsy. It is to be distinguished from ascites by the manner of attack. The patient first feels a weight & swelling on one side, which as it grows larger rolls about, until at length increasing gradually in size it becomes fixed, and then the abdomen swells regularly & gradually. The health of the patient is of the little affected by it. Tapping is the palliative cure, and should be done with a large Trochar, lest the fluid be gelatinous. When large they will adhere to the parietes of the abdomen, and then the operation is safer than at any other time. They are often made up of a number of cells, so that sometimes a small quantity of fluid is only discharged at one tapping. As this disease will certainly kill in the end, if it can be ascertained

early, it would perhaps be right to make an incision the whole length of the tumor & extirpate it entirely. Electricity has seemed of late, to have been of very great service to one patient afflicted with this disease.

Hydatids in the Kidneys.

Here they are generally situated between the external & internal Lamella of the proper tunic of the viscus, and yet out of the reach of relief.

Hydatids in the Liver.

They are most commonly found in the substance, sometimes they are discharged externally, the bags making their way to the Peritoneum & adhering to it: inflammation & suppuration coming on, the integuments ulcerate and the Hydatids are discharged. Mr Hunter on opening a Woman found a great number of them inclosed in one common bag.

Hydatids in the Lungs.

Sometimes they make their way into the Trachea, and are coughed up.

Hydatids in the Thyroid Glands.

They may become troublesome by impeding deglutition. They are found in the Cellular Substance in different

286. parts of the body, especially about the neck & about the lips in Women.

DCCCLXXXIX. As to the cure of encysted dropsy we can do little unless we can either procure a discharge of the contents and an obliteration of the cyst, or an entire removal of the whole.

DCCCLXXX. Tumors may appear in parts where they were not formed, but into which they have made their way from some deeper part. This circumstance the Surgeon should consider when he is about to extirpate a tumor.

DCCCLXXXI. If the Surgeon is not attentive to this circumstance, he may be deceived, and operate ineffectually, only removing a superficial appearance of disease, and neglect the deep-seated cause of it; and when probably some other tumor arising has driven the first into its present situation.

DCCCLXXXII. Some encysted tumors are found to contain a quantity of hair. The internal surface of these has taken on the nature & disposition of the cutis & Cuticle, & thus given room for the growth of hair.

In this manner we suppose hair is formed, which is found in tumors of the ovaria. Mr Hunter once found an encysted tumor in a sheep, which contained a

287 ball of wool. Now it is probable this was thrown off from the interior substance of that tumor on which it had formerly grown.

DCCCCCLXXXIII. The carbuncle as to its ultimate effect might have elapsed with mortification, as it produces a considerable sloughing of soft parts but some characteristic appearance attend it, which would shew it to be a distinct disease of a specific nature. -

DCCCCCLXXXIV. The predisposing cause we cannot easily ascertain. It cannot be supposed to be owing to weakness, as in general it arises not far from the source of circulation; and it does not commonly arise in weak parts, or in weak habits. Its seat is commonly the posterior part of the body, as the lower part of the neck, the back &c.

DCCCCCLXXXV. It begins with a considerable inflammation of the skin approaching nearer to the Erysipelatous than any other, the skin is somewhat tumid but not prominent, the part has a doughy feel. In a short time a pimple arises; the inflammation spreads rapidly & widely, and the cellular membrane to a considerable extent mortifies, the skin and muscles will retain their natural life.

DCCCCCLXXXVI. The skin above has pimples which

288. now ulcerate forming large holes, through which the sloughs of the cellular membrane are thrown off; and as they come away leave large chasms which are loosely covered by the skin, which is flaccid and hanging inwards. Sometimes the matter discharges itself through an infinite number of small holes.

DCCCLXXXVII. The disease tho it has its progress chiefly in the cellular membrane seems to begin in the skin, and the matter generated seems of a specific nature, which contrary to the course of all matter tends inwards, and borrows in the cellular membrane, which wants power to resist its spreading, from a want of adhesive inflammation.

DCCCLXXXVIII. Should not free openings be made in the infancy of the disease, to give free exit to the matter and to prevent its spreading and diffusing itself thro the cellular membrane?

DCCCLXXXIX. The loose skin remaining after the coming away of the sloughs of cellular substance should not be removed, as it will commonly in the end, unite with the subjacent parts & thus greatly forward the cure, which, if things go on well, from this time proceeds as in sound ulcers.

DCCCCXC. Boils seem to be a species of carbuncle; but more of the adhesive inflammation arising in the circumjacent parts they do not spread. The core of boils, vulgarly so called, is in fact a slough or mortified part thrown off.

DCCCCXI. The aged & feeble livers are most subject to carbuncles, — the young to boils.

DCCCCXII. Tho' the cellular membrane sloughs yet suppuration freely goes on, in which matter is either furnished from living cells which are themselves also about to die.

DCCCCXIII. Carbuncles are sometimes local and sometimes seem connected with a diseased state of the System.

DCCCCXIV. Bleeding is rarely proper, tho' at the beginning may be indicated sometimes, if there appears symptoms of inflammatory diathesis.

DCCCCXV. A diseased state of the system, as scurvy, may occasion both interstitial & ulcerative absorption of new formed substances, which we have shewn are weaker than original: — hence in violent scurvy, cicatrices have been known hastily to ulcerate & even callus which formerly re-united broken bones, become absorbed, and the ends of the bones loosened. Hence the constitution not having a power of supporting

290. the new parts, or even the original reclusions as it were the former and causes them to be absorbed.
DCCCXCVI. Tetanus or Locked-jaw is a disease in an involuntary contraction of voluntary muscles: sometimes it becomes an unnatural contraction of involuntary muscles & then perhaps it becomes fatal.

Unnatural contractions of muscles is a genus of disease that has many orders. - to it belong Tetanus, Cramp, Wry neck, St Vitus Dance, Substitus Tardius, one of the kinds of Dimsey, chore; it bears some analogy to Epilepsy & fatal Epilepsy, tho' these are properly affections of the brain. It is peculiar to the human species: Horses, monkeys, Stags &c are subject to Tetanus.
DCCCXCVII. When it affects the muscles of the lower jaw, it is called Locked jaw, when it extends to the anterior muscles of the body it is called Improper tetanus; when the posterior Episthotonus.

DCCCXCVIII. The predisponent causes will be whatever can render the habit weak & irritable.

DCCCXCIX. Amongst these (998) climate is a very common one; in hot climates it is extremely common, being produced by the slightest occasional causes, & even sometimes spontaneously.

M. In temperate climates it is more rare, in very cold climates it is unknown.
In this it is similar to other spasmodic complaints which are very common in warm countries, but rarely felt in cold ones.

291. M]. Other predisponent causes may be, fever, large suppurations, wounds of tendons, ligamentous parts.

These act upon the principle of producing weakness & an irritable state of the nervous system. Locked Jaw has been attributed to the wound of a nerve or tendon: with respect to the former opinion it seems quite erroneous: with respect to the latter, as wounds of tendons do not heal readily, they induce an irritable & weak state of the system, & this being present irritations which do not become sensible, give rise to it. Upon that principle it is, that it is known to follow large wounds, which have considerable suppurations, & which induce a weak and irritable state of the habit. It does not arise here from inflammation, for it does not take place till after inflammation has gone off. Mr Hunter is satisfied from his experiments that wounds of nerves or the including a nerve in a ligature made upon an artery, have no particular tendency to bring on Locked jaw, which he has frequently found to take place where it was evident no nerve was wounded.

M]. The most trifling external injury may be the occasional cause of this disease: even a scratch, or puncture where neither nerve nor tendon have been found to have suffered. —

292. ⁹MM. It appears to be a disease of the nervous system, and not of the principle of life: every circumstance appertaining to the latter commonly remains natural or unaltered, some time after the attack of the disease.

MM. The muscles of the lower jaw seem more disposed to take on the affection than any other muscles: here the disease commonly begins & spreads itself to other muscles; at length the spasm being extended to those muscles whose action is involuntary & necessary to life, then the patient is destroyed.

IV. It begins with a small degree of stiffness in the muscles raising the lower jaw; the patient finding a difficulty to open his mouth, at length the jaw becomes less & less capable of being depressed: the muscles of the eye-lids are next affected, and the upper eye-lid falls more & more, so that the patient looks like a person going to sleep: sometimes soreness of the mouth & throat precedes, but this is only accidental. Then the muscles of the head become affected. At first the head is held immediately erect by the spasm, then it is drawn backwards. The muscles of the spine become next affected, and the body of the patient is bent backwards. Then the muscles of the abdomen; the bowels are drawn inwards. The patient

293. complains of a pain in the lower part of the sternum, perhaps from the diaphragm being affected. A difficulty of respiration from the diaphragm being now affected with spasm. intercostal muscles &c in which last, an excruciating cramp like pain is felt. Universal convulsive motions of the body sometimes attend, like to *subultus tendinum*. In other respects health seems to remain & the functions of the body go on. The spasm of the involuntary muscles, however, increasing in violence perhaps the heart also becoming similarly affected the patient is cut off. Sometimes stupor precedes his death.

Stupor. This shews that the brain must be somewhat affected; as it is neither muscular, nor connected with muscles, it is difficult to say how this affection of it is produced. Is it from any compression of the brain produced by the spasm of the muscles of the neck making pressure on the jugular veins? or is it from sympathy?

MV. Should the patient live until the habit becomes accustomed to the disease, it then wears itself out & at length the patient gets well. In general however it kills before the system can be habitual to its action.

MVJ. The disease does not always increase gradually

294. and regularly as described (1003) but sometimes it will extend itself suddenly from the jaw over the whole body, so as to excite an unnatural contraction in the muscles in general. When the spasm confines itself to the jaw the disease may be called mild, then it does not prove fatal.

MVIII. The disease kills at different periods of time, but if the patient lives through the second or third week from the commencement of the complaint, the constitution becomes so much habituated to it, that it loses its power of destroying life, then wears itself out.

MIX. The disease continues sometimes even ten weeks, a great part of the time remaining stationary, and at last the patient gradually loses the spasmodic affection, and his muscles are restored to a natural state.

MX. All ages are subject to it. The delicate & relaxed constitution is most liable to its attack.

MXI. When it kills, the muscles remain contracted until the contraction is removed by force; but when art has relaxed them, they do not again contract. No preternatural appearance presents itself upon dissection in any part of the body. In general the disease kills suddenly. -

295. MXII. From considering what has been said we are perhaps enabled to discover,

1st why the patient remains under the disease a long time without his general health becoming affected.

2^d why the disease kills, & why it may kill at different periods.

3^d why it commonly cuts off the patient suddenly.

MXIII. No internal remedy has been yet discovered that will cure or relieve this disease.

Barb, Opium, blisters, Camphor, bleeding, warm bathing & a variety of other methods have been tried. However Mr H. has seen the patient recover, the disease has seemed to go thro' its natural course, & to have worn itself out, without his having had any reason to attribute any thing to the power of medicine. He recommends Sugar of Lead to be tried, upon the principle of the known tendency of lead to produce relaxation of muscles & inability in them to contract. Externally as a substitute for change of climate, he recommends that the patient shall be put into a cold bath, or an ice house. He never saw a patient die after the third week.

296. **MXIV.** External applications have also been found ineffectual. As climate is one great predisposing cause to the disease, a change from the present to a colder might be tried. Electricity has once been found serviceable.

MXV. As the indications of cure must be to relax the present contraction of the muscles, and to take off every disposition in other muscles to unnatural contraction, the external use of lead might probably deserve a trial. As lead, by producing a paralysis may cure one disease by producing another.

MXVI. If the locked jaw has followed a wound in any part of the body, the removal of the part wounded is not found to remove or lessen the disease, unless the tetanus arises during the state of inflammation of the wound. For when the injury is gone off, it must be evidently useless to remove it in case a locked jaw should come on: because, whatever irritation was heretofore applied to the part is now taken away & that is no longer the diseased part, nor can it now tend to cause or keep up the spasm, its action on the system has been already produced and terminated.

Cases of ^{it} Locked jaw.

A locked jaw and convulsions of the muscles of

297 The arm from a compound fracture of the radius.
Heat & perturbation of mind increased the symptoms:
he was always observed to be worse after drinking
any thing warm, or after warm external applica-
tions. Opium & bleeding were tried: he died the 8th day.

2nd

A soldier received a wound in his leg; when it was
nearly well a locked jaw came on. Mustk & Opium
were tried for 3 weeks, & the patient finding no change
could not take any more: - he continued in the same
state for 7 weeks or more, & then began to mend which
he continued to do insensibly until he recovered his
health. He took bark & port wine during the whole
of his illness. His wound healed long before his complaint
left him.

3rd

A soldier with a locked jaw after using mustk,
Opium, Camphor & even the cold bath, found no
relief when he left off all his medicines. he took
work for 8 days, & then began gradually to recover.

4th

A young man had his thigh amputated, had
violent pains in it & frequent spasmodic affec-
tions of its muscles. The 43rd day locked jaw came
on: on the 15th day became locked all over: on the
16th day he died. Opium, Ether, Sweating was

298. employed. The muscles continued rigid after death,
but when relaxed by force did not again contract.
5th

A sailor had tetanus affecting the lower jaw &
muscles of the spine; 2 weeks after having rec-
d a wound in the wrist: during his illness had
ischuria & costiveness, both of which were relieved
by a Clyster. — Opium, camphor, bark, steel, pos-
sive, cold were all tried: — he lived some days.
had pain in his heart: and great sense of oppression
about that organ having come on he died suddenly.

6th
A man had a locked jaw: it was uncertain
whether the disposition to it was induced by a wound
of the foot, or by a wound of the tongue. He died the
9th day. — The 2^d day of his illness the spasm ex-
tended to the muscles of the neck and spine: the
11th his skin became exquisitely sore to the touch: his
eye-lids did not open properly: he had universal
spasm, and a degree of stupor: the 8th his breathing
was difficult, and he had a pain in the lower part
of the sternum: the 9th he died suddenly.

10th
Locked jaw came on after trephining, Opium was freely
given: no visible good effect followed it, but after a fortnight
the patient mended gradually & got well.

299.

8th

Locked jaw arose spontaneously after nervous fever: the patient took nothing but port-wine, and recovered.

9th

Locked jaw arose in a child of two years old, after a scratch of the finger with a saw.

10th

Locked jaw arose spontaneously after Dysentery. Upon the whole, from what has been related, we may be justified in acceding to the conclusion given in 1806. 1813.—

Scrofula.

MXVII. Scrofula is a disease which may be considered as constitutionally local (191) it is not hereditary. As in other diseases so in this, ~~the~~ a susceptibility of the disposition for diseased action is all that can be inherited.

MXVIII. It is a specific disease, every process of which is marked with indolence & slowness of action whether it produces tumefaction, suppuration, or ulceration, all of which when the disease is true scrofula, go on with little or no pain.—

300. **MXIX.** When it produces swelling of a part the tumefaction increases slowly, there is hardness with little pain or soreness; all the appearances of common inflammation are wanting. Should no resolution of the tumor take place a kind of suppuration is produced.

XXX. When the tumor becomes soft and suppurates, which it does very slowly & without pain, the matter very gradually makes its way to the external parts.

XXXI. The ulceration of the integuments in order for the evacuation of the matter, is equally slow & tedious: the matter does not make point as in healthy abscesses, but it stretches the skin equally to some extent & renders it (as far as it distends it) shining & of a purplish hue. — In this state the disease will sometimes remain stationary for months. — When the skin can no longer resist the pressure of the matter, it bursts and a fluid, like a mixture of curds & whey is evacuated. There is rarely any common pus when the scrofula has gone on pure & unmix'd with the common inflammation.

XXXII. When the abscess has emptied itself it does not readily fill up or suffer the cavity to be obliterated, but will often remain a fistula, the small hole thro' which the matter bursts remaining open. —

301. MXXXIII. When scrofulous ulcers granulate, the granulations are large, soft, & pointed, appearing like a transparent glossy substance; their sensibility is little, the margin of the sore is loose, flabby & turned inward. — the skin round about it has a purplish hue. the granulations want the power of contracting () so that the ulcer will continue stationary, or at most its size will be slowly diminished.

MXXXIV. The process of cicatrization is equally difficult & tedious, and when formed has not an healthy appearance.

MXXXV. The disease seems to have a sedative effect upon the system, diminishing all the actions of the parts which it invades.

MXXXVI. It has a power of producing in the parts, surrounding the part originally diseased, a similar state, but it does not produce continued sympathy in any great extent.

MXXXVII. The predisposing cause is a delicate & irritable constitution with weak powers of action. The parts most disposed to take on scrofulous action are the lymphatic glands, especially those which are most exposed to the influence of the atmosphere, as the glands of the neck and lungs, the mesenteric glands, joints, particularly those of the foot and

302. hand, ligaments, the soft ends of bones; in all which parts the strength & powers of restoration are but small.

XXXVIII. Persons between the age of 15 ~~40~~, of a fair complexion and light hair; who do not appear to have the usual quantity of red blood in their vessels. Those who live in climates very changeable & irregular are most liable to this disease.

It is not peculiar to the human species several quadrupeds as monkeys, some birds as turkeys, fowls, are subject to the action of scrofula.

XXXIX. Tho it produces continued sympathy to a small distance; it has no power of affecting the absorbents, nor is the disease capable of being communicated by them: it cannot like the small-pox be communicated by inoculation.

XXXX. The skin is rarely if ever, originally & primarily affected by this disease; it may however fall into it from continued sympathy.

XXXXI. The exciting causes will be external violence especially if not very great: sudden application of or sudden exposure to cold, the use of mercury, the slightest of external violence in habits predisposed

303. to it (1026 & 27) will cause the parts to take on a scrofulous action.

MXXXII. The susceptibility of scrofula in some constitutions is so great, that any complaint which deranges the habit for a time, as fever, syphilis, small pox &c. will give occasion to a scrofulous disposition and action.

MXXXIII. The appearances of scrofula will vary according as different parts are affected: it will, however, always be found with one of the following circumstances.

- 1st a circumscribed tumor.
- 2^o - a tumefaction more diffused.
- 3^o Suppuration without tumefaction.

MXXXIV. The circumscribed tumors are chiefly lymphatic glands, although they are sometimes found in the brain, breast, uterus & testicle.

MXXXV. When the disease attacks a part which may suffer without much disturbance of the general health, we are often unacquainted with the nature of the disease, until a swelling, in consequence of suppuration, appears either in the part originally diseased, or in some other part to which the matter has made its way, the suppuration going

304. on without inflammation, and perhaps without pain.

MXXXVI. When the disease affects the knee the pain is more considerable than when other parts are attacked; and here somewhat of the true inflammation is mixed with it.

MXXXVII. Whenever the lower extremity is the seat of the disease, the limb appears longer than the other; this is from the patient particularly favouring that side and leaning on the other.

MXXXVIII. Children are often lame for months. At length a swelling has appeared in the foot. The swelling has ~~appeared~~ sometimes does not subside ~~when~~ when scrofulous abscesses appear about the fingers, hand, or foot, even after the matter has been discharged.

MXXXIX. Lumbar abscesses sometimes appear without any previous pain. Sometimes patients remember to have had pains in the loins. In general however if they have pain it is felt beyond the seat of the disease, as in the thigh, knee or foot. The matter here very frequently presents itself in the thigh tho' formed in the loins.

MXXXX. Patients under 30 are more subject to this

305. complaint: it is produced by the common exciting causes of scrofula: it is distinguished from a disease of the hip by attending to the motion of the foot.

MXLJ. Abscess in the joint of the thigh is of the scrofulous kind. - there is commonly a thickening of the soft parts forming & surrounding the joint. The patient has a sense of weakness in the limb which wastes and has its motions contracted.

MXLJJ. White swelling is a term that may be applied to every scrofulous swelling of a joint; before the skin becomes inflamed it is generally attended with an increase of synovia: sometimes it is truly scrofulous & sometimes has a mixture of the common inflammation.

A fever has sometimes cured scrofula, & hence we might be led to think that stimulating medicines are indicated; but the analogy will not hold good, for the disease is a specific one. It will go on until it has worn itself out, - until it has destroyed life, - or until it is destroyed or rather cured by some specific.

Should lumbar & hip abscesses be opened?

They are in themselves incurable, possibly a chance for life may be given to the patient by opening them early, (i.e.) as soon as we are satisfied absorption of the matter cannot be brought about: & some

306. scrofulous abscesses we can obtain a re-absorption of the fluid: It is always to be desired, as the healing of them after ulceration has taken place is accomplished with difficulty.

MXLIII. The common pulmonary consumption is generally a scrofulous affection of the Lungs.

MXLIV. The young, the fair & the delicate are most subject to it, & the common exciting cause is cold. It commences with tubercles in the lungs; swelling of the glands of the neck often appears in the beginning. The disease increases slowly; the tubercles suppurate, and ulceration being formed, the patient becomes hectic and is at length destroyed.

MXLV. The pulmonary consumption is however seldom a purely scrofulous affection; it has generally somewhat of the common inflammation mixed with it, as we know from the pain in the chest, the quick hard pulse &c.

MXLVI. An hæmorrhage from the lungs is not uncommonly the forerunner of pulmonary consumption, but how far this has to do with scrofula we cannot determine.

MXLVII. The Testicle is also the seat of scrofula. As in its action upon other parts, so here its attack also

307. is scarcely known. Its progress slow.

MXLVIII. It rarely occurs before the age of 16. or in old age.

MXLIX. The breasts of women also fall into this disease in which they will gradually, slowly, with little pain swell to an enormous size.

ML. The scrofulous testis (1047. & 8.) Breast (1059) are to be distinguished from cancers of those parts, by the want of swelling in the spermatic chord, and axillary glands; also by the absence of local sympathy, at least until the skin is beginning to be affected by the suppuration.

MLI. The indication of cure in scrofula with respect to the constitution are

- A. {
 1st To give strength to the system
 2nd To counteract the effects of climate
 3rd The use of some specific. }

With respect to a part

- B. {
 1st To produce resolution of the tumor, or absorption of matter if it has supplicated, or
 2nd The extirpation of the disease, if practicable. }

MLII. The indication (A. 1st) are endeavour to fulfil by bark, and other tonic medicines.

The indication (A. 2.) by changing the constitution of the patient: or if that cannot be done by rendering the system susceptible of the influence of the climate in which the patient lives.

The indication (A. 3.) by the administration & application of such remedies as experience has approved.

MLIII. If climate cannot be changed (which is to be desired, & which should always be allied to a warmer & more regular), then we may lessen the susceptibility of the body by tonic medicines, cold-bathing, and the use of such cloathing as will maintain on the surface of the body, an uniform & equable heat, such as flannel, which conducts heat from the body badly.

MLIV. Experience seems to have approved the powers of sea-bathing as the most powerful specific in every scrofulous complaint, whether hip-cases, white swellings, consumptions &c. and some specific powers are also to be attributed to Fossil Alkali. Kenlock.

MLV. Sea-bathing is to be used with that degree of heat which is found most agreeable to the system, and followed by the greatest increase of vigour & spirits.

We consider sea-bathing as a specific in

scrofula, but we are always to consider under what circumstances it will act most powerfully, — for instance, whether sea-bathing be a cold-bath; sea-bathing be a tepid bath; or sea-bathing and a warm bath, will agree best with the patient. For we are not only to consider what will cure the specific disease, but also what will best agree with the patient's constitution. Some persons cannot bear cold bathing but will find themselves much refreshed by the tepid bath; again others require the heat of the warm bath, to render sea-water agreeable to their constitutions; again, the season of the year is to be considered, for more additional heat will require to be given to the water in the winter than in the summer, if the cold cannot be endured. In the warm or tepid bath the patient should remain 10 or 15 minutes with the precaution of tempering the heat to the agreeable degree. Sea-bathing may be employed in all cases of scrofula, even pulmonary consumption; to prove that the bath agrees with the patient he should feel a glow & his spirits revived by its use: if these appearances are wanted after the 2^d or 3^d trial, and the patient feels

310. himself chilly and enervated, some other degree of heat should be tried. In bathing, the sores of scrofulous patients sh^d always be uncovered.

MLVI. The means recommended (1052, 1053, 1054, 1055) are not to be insisted on where there is greatest predisposition to the disease, and the patient most disposed to the action of exciting causes. Hence children & young persons stand more in need of them than those advanced in life: also in irregular climates and winter, more than in regular climates & in summer. For the winter favours the progress of scrofula: therefore sea-bathing and flannel doathing are more necessary in winter than in summer. (It is a bad practice with parents & nurses to carry young children about in the cold with the extremities naked & exposed to the atmosphere: they bear cold ill & suffer more from it than those advanced in life.)

MLVII. We are not to expect a speedy cure from any remedies used in the treatment of scrofula; length of time being always required to give them efficacy: from 3 months to 2 years.

MLVIII. Moderate exercise is to be recommended, & perhaps a vegetable diet may be employed with advantage.

311. MLIX. Mercury is in general improper in scrofulous complaints. Bleeding is often necessary in scrofulous lungs, to diminish the quantity of blood to be circulated thro' the pulmonary artery. Proportion it to the quantity of unobstructed lungs.—

MLX. As to the topical treatment, where the disease admits of it, and it can with propriety be moved all at once, extirpation is the best method.

MLXI. In the resolution of tumors, or the healing of scrofulous sores few topical applications except sea-water, and the juice of hemlock are of any advantage.

MLXII. Stimulating applications are generally injurious; violence increases the action of the parts, & at the same time does not cure but add to the disease.

MLXIII. When there is suppuration the abscesses should not be opened with a knife, but in general they should be left to break of themselves.—

MLXIV. Variations in age will often tend to the spontaneous cure of the complaint; & this is most observed in females.

MLXV. In scrofulous bones, exfoliation is tedious and obtained with difficulty. In these as in soft parts every process of exfoliation goes on not without difficulty.

MLXVI. In scrofulous ~~bones~~ swellings sometimes only

312. a white curdy or caseous matter is formed: indeed the parts being altered in their structure and incapable of carrying on their functions lose their life, but do not putrify, nor is there a disposition of the parts in contact to throw them off; themselves being also affected by continued sympathy.

Rickets.

MLXVII. Rickets may be defined.

1st a want of disposition in the vessels of the bone to form calcareous earth arising from a weakness of a peculiar kind, or

2^d too great & hasty an absorption of earth from the bone in proportion to the quantity formed by the vessels.

MLXVIII. It is a disease of the constitution. It originates in a weakness of a peculiar kind; for weakness in general does not produce rickety complaints, altho' rickets are always attended with weakness. The first cause (N^o 1) operates in the production of rickets in children: the second (N^o 2) produces the disease in adults.

MLXIX. The rickets in Children are known by the

bones becoming enlarged, by their bending under the incumbent weight of the body, and yielding to the extraordinary action of the muscles, so as to be thereby distorted.

MLXX. A certain size in the bones and a certain proportion of earth should be present together. As the size of the bones is determined in adults, it is impossible the increase of the bones in size beyond their proportion of earth can constitute the disease in the full grown subject.

MLXXI. But in children this is the case: it is a known fact that during the time of growth, the enlargement of the bones is the greatest; whilst the quantity of earth formed in them is the least; for the formation of earth checks the growth of bone.

MLXXII. The animal matter of the bones is also altered, for it is found to be different from the animal ~~parts~~ matter of bones simply deprived of their earths.

MLXXIII. The rickets cannot produce an increased growth of bone in the adult, but in other respects, as in softness of the bones & their inability to support weight & muscular action. Tho the cause of rickets in the infant & adult may be different, the effects will ultimately be the same.

344. MLXXIV. The general consequences of rickets in parts supporting weight, are, that the joints are obliged to form more acute angles.

MLXXV. From what has been advanced we are enabled to understand, why the bones of the inferior extremities are more frequently bent than those of the superior. Also, why those of the superior themselves are sometimes bent, why the knees are knocked.

MLXXVI. Why the disease affecting the spine shall produce difficulty of breathing, & other complaints of the viscera: & why it should render the pelvis distorted and labours difficult.

MLXXVII. The bending of the bones & their throwing an increase of weight upon the joints, gives rise to the stimulus of necessity which excites a disposition in some parts to take on the ossific inflammation & to generate new bone: hence irregular exostoses, Anchylosis of the joints.

If the bones of the Cranium have been affected an irregular ossification may arise on the inside next the brain, and by its pressure induce morbid affections of that viscus.

On the concave side of the incurved bones nature will sometimes form an additional quantity of bone, in order to strengthen the original one.

Of the softness or ricketty bones, a case occurred

at Lime-house where the bones were as soft as tapers.

It is unnecessary to add that Mr Hunter considers the *Mollities Ossium* as a species of the rickets, and that it is here described as rickets in adults.

MLXXVIII. From what has been said we also understand why bones bend in particular, and in different directions.

MLXXIX. For this disease no certain remedy has yet been discovered.

MLXXX. The disease is either a species of, or allied to, scrofula, and sea-bathing seems to be what approaches nearest a specific for it, as well as for scrofula.

MLXXXI. The general indications of cure are to give strength to the system, hence the cold bath, exercise, bark, and other tonics may be advantageously employed.

MLXXXII. *Enostosis* is probably somewhat in its nature similar to rickets; it is a growing of a bone from a bone.

MLXXXIII. It appears to be of two kinds.

1st Constitutional.

2^d Local.

In the first a similar disposition shews itself in almost every bone: in the latter perhaps only in a single bone.

MLXXXIV. It has generally its seat near the

3/6. heads of bones therefore seems much connected with soft parts.

MLXXXV. The Tumor sometimes arises all at once out of the substance of the bone: sometimes very gradually.

MLXXXVI. When near the joints it somewhat produces lameness, altering the direction of the muscles and tendons.

MLXXXVII. It is peculiar to youth, and rarely appears in the more advanced stages of life.

MLXXXVIII. This we know the absorbents have a power of removing superfluous substances, even bony ones, yet we know no remedy whose powers will either produce a removal of those tumours, or a prevention of them.

MLXXXIX. Where the tumors can conveniently be removed by mechanical means, it should be done by the pincers, chisel, or saw.

Fistula
MXC. Fistulae are of two kinds.

1st a passage for the discharge of pus &c from a diseased part.

2^d. An artificial canal instead of some natural one, the natural one being obstructed.

MXCI. It is in consequence of some part being

317 afflicted with disease which they are not able to get the better: although the fistula itself is seated in a sound part.

MXCII. The diseased parts to which the fistula leads, is always larger & more extensive than the fistula itself.

MXCIII. As the fistula commonly opens in the skin, and as the diseased part is more deeply seated, the lips of the skin will be more inverted (though sometimes the lips of the orifice are everted so as to resemble a prolapsus ani) & the orifice will be nearly filled up with loose fungous granulations, which if destroyed will readily shoot up again.

MXCIV. Whatever is the disease in the part to which the fistula leads, until the obstruction to its restoration is removed, or its disposition, if specific or unsound, is changed no cure will be obtained.

MXCV. If the seat of the disease extends to or occupies a vital part it will tear the patient and the constitution until hectic is induced & death succeeds.

MXCVI. The indications of cure in the first species of fistula (1090) will be:

1st the removal of whatever obstructs the healing of the parts. &

2^d the inducing a new disposition to the diseased parts.

318 MXCVII. The first indication of cure, will consist in the removal of all foreign or stimulating bodies, or splinters of bone & under the limitations heretofore given in cases of Gunshot wounds & diseases of bones.

MXCVIII. The second indication (1096) will be fulfilled by laying open the fistula, or cavity, throughout its whole extent, and even carrying the incision into the sound parts. That the mouth of the cavity may be as large or larger than the surface of its bottom & that the whole being exposed, as necessary for some new process, in consequence of the irritation & exposure, may arise.

MXCIX. If the parts in question have any powers of restoration, the consequence of (1098) this treatment, will be the excitement of inflammation, suppuration, and ultimately granulation, which will at length fill up the natural cavity and cure it.

MC. In the second species of fistula the indication of cure will consist (1099)

MCI. 1st in opening again the natural canal, or
2^d in making some new one which will answer the purposes of the old one.

MCII. In the first species there is greater disposition

319. to heal in the parts thro which the fistula passed, than in the deeper seated parts—hence the disproportion in size. (1091. 1092. 1098.)—

MCIII. We cannot simply from the appearance of a fistulous orifice determine its extent: we must therefore examine its depth; the seat and extent of the disease, by some convenient instrument, as a probe &c.

MCIV. Sometimes one diseased cavity will have several openings leading to it. It is generally necessary to lay the whole into one cavity, and to induce a healing disposition at the bottom of the cavity.

MCV. When fistulae and the parts they lead to are laid open, the external parts should be kept from healing, until the deep seated ones have acquired a disposition for restoration and the ulcer can be healed from the bottom.

MCVI. These observations may be better understood by considering,

- 1st Fistula in ano,
- 2^d ——— in perineo,
- 3^d ——— leading to joints,
- 4th ——— of lungs, liver &c.
- 5th ——— Saccrymalis
- 6th ——— of the pectoral duct,
- 7th ——— of Cooper's gland in females.

320 MCVII. Fistula in ano is the consequence of inflammation, beginning two, three, or more inches high up in the cellular substance on the outside of the rectum, which going on to suppuration, the matter descending commonly makes a point externally near the anus and bursts. But sometimes the rectum becomes so diseased that it will also give way and a breach be made in it opposite to where the inflammation began.

MCVIII. The cure (1098) will consist in laying open the whole cavity, making its external mouth equal to, or larger than the surface of any side of the cavity, and preventing the too early re-union of the lips of the wound. (1105.)

A person had a fistula in ano, for which he was thrice cut, but the part still remained fistulous. Upon a more accurate examination it was found that the sinus extended two inches above the anus and then penetrated: above the orifice it continued its course along the side of the gut for another inch; the incision was then carried up to the end and the man got well.

MCIX. In fistula imperforata there will often be several sinusses whose mouths open externally, communicating with the fixed point of the disease. Here it is right to treat if we can according to the rules given above,

321 before a cure can be accomplished the diseased disposition of the parts must be changed: for instance, strictures in the urethra must be cured if they give rise to the fistula.

MCX. Fistula in perinaeo may have for its cause, stricture in the urethra, disease in the prostate gland or membranous part of the urethra; the external orifice cannot heal as long as the disease remains uncured.

A fistula in perinaeo will not get well, tho' a wound in the same part in lithotomy readily heals. In the latter the internal parts have not lost their disposition to healing, - hence there is no obstacle to the cure.

MCXI. Fistula communicating with joints will not heal because they communicate with parts whose powers of restoration are weak, and making free openings only increases the disposition to disease & the violence of the Pectic. Neither can we cure fistula of the lungs or liver, because we cannot lay open the cavity.

MCXII. In cases, therefore, where we cannot have recourse to the treatment recommended (p. 98 &c) we can only endeavour to give power to the constitution by tonic & strengthening medicines, that if possible a natural cure (tho' little to be expected) may be obtained.

We take no notice of amputation for fistula in joints as it has nothing to do with the doctrines now before us.

322. MCXIII. *Fistula Lachrymalis* is sometimes an original local disease, sometimes constitutional, as arising from syphilis, scrofula &c.

MCXIV. From whatever cause the ductus ad nasum may become obstructed, whether from inflammation or a disposition to contract similar to that which arises in other membranous canals (as the urethra &c.) forming strictures in it, the passage of the lachrymal sac is impeded; distention gives a stimulus to the lachrymal sac, which stimulus is also increased by the salts in the tears;—hence inflammation & suppuration is produced, and the matter bursts thro' the skin near the eye.

MCXV. Thro' this new & unnatural opening the purulent matter mixed with the tears continues to flow, until the Surgeon either dilates the natural canal, or makes a new one, that the tears may again have a passage into the nostril & then the fistula will heal.

MCXVI. If the obstruction in the natural passage is very great, dilatation of it will rarely cure, because we cannot in general destroy the disposition of the canal to form strictures, and these recurring the disease will also return, so that most commonly a new artificial canal into the nostrils must be formed.

MCXVII. *Fistula of the parotid gland.* The duct from the parotid gland passing over the Masseter and

Buccinator muscles, consequently lying very superficially is extremely liable to be divided, and the Saliva will flow outward from the end next the gland. Or suppuration from any cause whatever arising in the duct, and bursting externally a similar circumstance will take place.

MCXVIII. The cure is performed by passing a needle armed with a round ligature of thread from without thro' the duct into the mouth and let the thread remain there until the wound made by the needle has lost a disposition to heal. The external wound we should suffer to encourage to close.

MCXIX. The ducts leading from Cooper's glands in females to the inner surface of the vagina are sometimes obstructed, and a sac will be formed containing a slimy matter, which will cause a distention of one of the Labia to a prodigious size, and produce the resemblance of a Hernia.

MCXX. An incision should be made into the tumor and the matter discharged, after which the incision should be suffered to heal.

MCXXI. Then a second crucial incision should be made into the sac, near to the natural opening of the duct, and this should be kept open until it has lost all disposition for healing, & the mucus is

324. discharged, as it formerly was, by the natural passage.

MCXXII. Unsound abscesses are to be considered as two fold viz.

1st Those forming in a part.

2^d Abscesses of a part.

MCXXIII. In the first we have a collection of matter formed in the part where they appear; and in the second the matter is formed in some other part more or less distant, and from thence makes its way to the part where it appears.

MCXXIV. Of the first we have instances in many scrofulous suppurations, in abscesses of the Joints &c.

MCXXV. Of the second we have instances in the Psoas muscle. Hip joint, which often present their matter in the thigh or groin.

MCXXVI. Whether the latter burst or are opened, the doctrine of fistula will apply to them: nor will opening unsound abscesses of a part be of utility unless we can also induce in it a disposition to heal, or we have some foreign body to remove, as a splinter of bone &c.

MCXXVII. Unsound abscesses are generally caused by some specific disposition to scrofula. Syphilis &c. or from

a disposition to indolence, either acquired or natural that is, either in parts which have natural powers of healing, but fall into a state of diseased indolence; or in parts which have naturally but small powers of healing, as in joints, ligamentous parts. &c.

MCXXVIII. New formed parts as cicatrices, and callus are sometimes suddenly falling into the ulcerative and interstitial absorption, and the progress of the absorption will be very rapid: as this arises from an unsound disposition in the constitution that disposition is to be removed, or altered.

MCXXIX. We come now to poisons, especially the animal, principally the morbid.

MCXXX. But we can give no unexceptionable definition of Poisons.

MCXXXI. The definition, however, which we can give, & most free from exception, is

A matter which produces a peculiar mode of irritation & affects the vital principle in a peculiar manner, whenever used in the smallest possible quantity, and this without any relation to any known chemical or mechanical power, or by any common irritation.

By this definitive Class Metallic salts, even

326. Arsenic & a variety of vegetable substances, as crow figs, Hemlock, Opium &c are excluded from the class of poisons: also honey, particular kinds of fish &c for three reasons.

1st because these are not poisons in the smallest possible quantity.

2^d because their action is not universal

3^d because their irritation is not specific, but common.

MCXXXII. We know no substance in the mineral kingdom answering to this description, nor is there much poison of this nature in the vegetable, but the animal Kingdom possesses it in great abundance.

MCXXXIII. No secreted fluids are poisonous to the part secreting them, but they will act as poisons on any other part of the animal to which they belong.

MCXXXIV. Poisons answering our definition (1131) are of four kinds: viz.

1st those which act locally as the sting of a canker, &c.

2^d those which have their effect on the constitution, as Goat fevers, Hooping cough &c.

3^d those whose influence is upon the whole nervous system, as the poison of the mad-dog, of Indian poisoned arrow &c.

4th those whose powers are mixed, as the poison of the small-pox, syphilis &c acting both locally

327. and on the constitution.

In the animal kingdom, some beings, as the bug, muskito, poison the part at the same time that they get their food from it. The bug, for instance, poisons the part & produces an extravasation of its juices which it feeds upon. The leech after making a wound poisons the vessels of the part wounded, so as to almost destroy their power of contracting, - hence the hemorrhage which often continues so long after a leech has been sucking, which never follows other similar wounds.

MCXXXV. We intend to consider Animal poisons only and those are of two kinds. Viz.

1st natural,

2^d Morbid.

MCXXXVI. The Natural are such as belong originally and naturally to the Animal possessing them, and not depending upon preternatural affection, or alteration in the structure of any body or its parts.

MCXXXVII. The Natural has no power of propagating its effects beyond the individual; its powers are exerted in poisoning. -

MCXXXVIII. The morbid on the contrary depends on a preternatural action, or change of structure in the body communicating. -

MCXLIII.

Inflammation is produced in the part
of the adhesive kind, for the parts swell, which rarely
terminates in suppuration, though sometimes pus
is formed. —

TELEX

MCXXXIX. But the morbid in general, may be communicated by the body poisoned, to other bodies; and therefore may be propagated to many individuals, because the individual poisoned receives the same power of poisoning others, as the animal possessed by which it was poisoned. -

MCXL. Some of the natural act locally, as the wasp; others both locally & constitutionally, as the viper, rattlesnake &c. -

MCXLI. Those acting on the constitution generally first produce local effects, before they are absorbed and affect the system.

MCXLII. Pain in the part receiving the poison, red streaks & swellings at the lymphatic glands in the course of absorption are sometimes preludes to rigors, convulsions, general livid extrications, swelling of the whole body & death.

MCXLIII. The pus is of the common kind, when it forms, and, it contains no poison; whereas when suppuration takes place in the morbid poisons, the pus itself is poisonous.

MCXLIV. All the natural poisons must come in actual contact with the part to be poisoned; some require to be by a wound in order that their influence may be exerted.

329.

MCXLVI. Morbid poisons probably all originated from a diseased state of the body or of parts.

MCXLVII. Many are obliged to the power of contamination for their continuance, and that power destroyed, would cease to be known.

MCXLVIII. In what they differ from the natural has been already shewn: they are, like the natural, communicated by contact, & some of them in a state of vapor.

MCXLIX. Those which arise spontaneously seem to be confined to the species of animals in which they arise as Cancer, Syphilis &c. which are peculiar to the human species, and cannot be communicated to any other animal.

MCL. Morbid poisons applied to animal bodies have specific distances of time between the time of applying the poison & the time of its producing irritation.

Mr Hunter suspects the venereal poison militates a little against this definition of poisons, in that he imagines its action depends in some measure on the quantity applied.

Small pox by inoculation between the time of its application and the time of its visible irritation requires 2 or 3 days

Natural small pox 23 days. Measles 9 days. Cancer some months. Sick time not ascertained.

330. MCLJ. The natural poisons do not in general produce extensive local sympathy.

MCLJI. Morbid poisons being applied to a part, that part becomes infected and diseased without a power of contaminating other parts by means of the absorbents, as in the itch; or

MCLJII. Morbid poison being applied to a part, that part becomes diseased, and has a power of communicating the disease to other parts, but not to the constitution, as the Cancer, or

MCLJIV. When a part has the power of contaminating the system, as the small pox.

MCLJV. Of the action of some poisons, as small pox, measles &c the constitution is sensible only once in the course of life; of others it may have the action repeated.

CANCER.

MCLN. Cancer is a disease produced by a morbid poison arising spontaneously in a part, without being able to account for the manner in which it is generated.

MCLNII. It is a local disease which may produce a consequent similar local disease in another part, but has never the power of affecting the constitution.

MCLNIII. Some parts are more liable to be affected

331. produced from different poisons than others: so the secreting glands are always the seat of cancer; the breast & uterus in women; the lyp. external n. n. pancreas, pylorus & testicle are commonly seized with this disease.

MCLIX. It is a poison of whose action the human species is alone susceptible; experiments have shown that it cannot be communicated to other species of animals.

MCLX. We find in parts affected with cancer an indurated knotted feel, with a kind of suppuration in the centre; or an ulceration of the external surface attended with pain.

MCLXI. Previous to a disposition to ulceration being formed, the pain is dull and heavy; but this disposition being produced, the pain becomes violent, giving a shooting, burning sensation.

MCLXII. The part affected has its functions destroyed. If a secretory organ, it loses entirely the power of secretion.

MCLXIII. In its superadding process the cancer becomes adherent to the surrounding parts; the skin becomes discoloured, smooth, and shining, and matter is found sometimes without much previous inflammation.

332. MCLXIV. When the cancer is cut into, previous to ulceration having taken place, there is sometimes found the appearance of a cyst, which contains an ill-conditioned serum, blood, curdy matter &c but seldom, or ever matter resembling good pus.

MCLXV. The progress of cancer in all its states and stages are slow.

MCLXVI. When ulcerative absorption has taken place the integuments round the ulcer, are tight & rigid, the skin is turned in at the edges and wrinkled into folds; an ill conditioned matter is discharged.

MCLXVII. The Lymphatic glands in the neighbourhood become indurated and enlarged, sometimes soon. Sometimes even before the ulceration has taken place, and little lumps are sometimes formed in the circumjacent skin.

MCLXVIII. It has a power of poisoning other parts and of producing in them a similar disease, but it has no power of contaminating the constitution.

We may infer that cancerous virus has no power of infecting the blood, or producing similar diseases in any part by means of the blood.

One reason why cancerous matter should not be able to act upon the system when absorbed, may be, that it is so slow in producing its action, that time cannot be sufficient for that purpose after its being absorbed, before it is thrown out of the body. —

333. MCLXIX. A cancer of one part may produce sympathetic swellings of other parts, but not true cancers, unless in parts which are in the course of absorption.

MCLXX. Constitutional effects, as hectic fever &c. may arise in consequence of a patient's labouring under a cancer from the irritation the disease produces, but the affection of the constitution will be only that common to simple irritation, nor will there be any thing specific or peculiar in the manner in which cancerous irritation acts upon the system.

MCLXXI. The time of life seems to be the powerful predisponent cause of cancer. The age which most strongly predisposes is from forty to sixty: it sometimes however appears earlier, tho' rarely.

MCLXXII. The exciting cause III 11

MCLXXIII. The parts most susceptible of the cancerous disposition seem to be those proper to the sexes.

MCLXXIV. Women are more susceptible of the cancerous disposition than men, probably because they have more parts peculiar to sex.

MCLXXV. Is there not another cause in the parts

334 peculiar to sex in women, at the given time of
life, undergoing a change which renders them in-
fit for procreation?

MCLXXVI. We know of no medicine which will
cure a cancer.

MCLXXVII. Arsenic is probably a specific for
the cancerous disposition, but its powers are too weak to
produce a cure, nor will the system allow of its being
introduced in sufficient quantity.

MCLXXVIII. Yet a cancer if left to itself always
kills, either by its constant irritation exhausts the
principle of life, or by producing continued or
contiguous sympathy, and thereby inducing a similar
diseased affection in some part necessary to life.

MCLXXIX. Therefore extirpation of the diseased part
is always to be desired, and if practicable always to be
performed before a consequent cancerous affection
has taken place in any other part.

MCLXXX. We are always to consider not only the
original or first formed cancer, but also any part wh.
may have been poisoned by matter absorbed from it,
to which we call the consequent cancerous affection.

MCLXXXI. Nor can we be always certain that a
consequent cancer is not formed, because ulceration &

335- the formation of cancerous matter has not taken place.

for.

MCLXXXII.

Coagulable lymph which had been extravasated in the thickening & induration, if absorbed will equally contaminate & poison the parts to which it is applied; for whatever the fluid separated in a part may be it will always possess the specific properties of the part from which it is secreted. -

MCLXXXIII.

The consequent affection begins either in the lymphatic glands, or in the lymphatics themselves, but a cancer once formed whether original or consequent there is no part contiguous to which it may not extend its action, even to bone.

MCLXXXIV.

Hence cancers should always be extirpated as early as possible: the earlier they are removed the fairer prospect has the patient of future health.

MCLXXXV.

Previous to extirpation it is always necessary to observe.

- a. The common rules laid down touching the extirpation of tumors. ()
- b. Whether any consequent affection is already formed & where.
- c. Tho' no consequent cancer is visible whether there is just reason to believe a disposition for one is any where formed. -

336. MCLXXXVI. In the extirpation it must be an invulnerable rule to take away the whole of the disease.
- MCLXXXVII. If the whole of the disease cannot be removed extirpation is not to be attempted.
- MCLXXXVIII. If the tumor adheres to the skin it should always be a rule to remove more skin than the diseased part is adhering to; that if possible we may be sure of not only taking any part in which it is probable from its contiguity that a disposition for a consequent cancer may be formed.
- MCLXXXIX. The consequent if left will be equally injurious & equally fatal with the original cancer, and tho' the original be taken away, will itself contaminate other parts in the same manner and to the same degree as the original, and is equally incurable by any power of medicine.
- MCXC. Notwithstanding all our care the disease will sometimes appear again even after we have removed all evidently diseased parts, and those also which we are justified in suspecting.
- MCXCI. For the slowness with which the cancerous virus sometimes acts may be a cause of deceiving us: a disposition to consequent disease may be formed in some part, which we, of which we can by no signs whatever ascertain the existence.
- MCXCII. Nevertheless when the operation is admissible

we ought always to endeavour at the extirpation of the cancer.

MCXCM. Cancer must be distinguished from serofula, and from indolent thickenings of all kinds, which may be done not only from its appearance, pain & but also from its acting as a poison on the neighbouring parts, which serofula & indolent thickenings never do.

MCXCIV. It should also be distinguished from the fungoid sore, which tho' it is not a poison, and as it has always been considered as cancerous, may not improperly be noticed in this place.

MCXCV. The fungoid sore is a specific entirely local, and has no power of contamination or poisoning parts, beyond the extent of continued sympathy. & even this not widely diffused.

MCXCVI. It has its seat in every part of the body without exception.

MCXCVII. It begins in a circumscribed tumor, partly solid or encysted; is not for a time very painful; it gradually, and not very hastily, enlarges: the skin becomes discoloured, and at length bursts & ulcerates.

MCXCVIII. A loose spongy fungus of the colour of dark cruor is then thrown out, which rises

338. and enlarges faster than escharotics can take it down: It bleeds easily from the surface of the fungus, and its pain is acute.

MEXCIX. It resembles cancer in being absolutely incurable by medicine, and if left to itself destructive.

MCC. But it differs from cancer in not being poisonous, and in never producing either in the lymphatics or lymphatic glands, a similar affection.

MCCI. This disease kills without seeming to have done so much mischief as might be supposed admissible without destruction of life.--

MCCII. Nothing can be done to relieve the patient, but extirpation, in which we should be extremely careful to remove every atom of disease, otherwise the part will again take on the same affection.

MCCIII. Many diseased appearances on the face, which have been considered as cancerous, are only fungated sores.

MCCIV. In the extirpation of cancers, three methods have been employed, viz. --

1st The knife, or excision

2^d The use of such means as produce the death of the whole diseased parts, and the consequent separation of them from the sound parts.

MCCV. Diseased as well as new-formed parts () have much less power of preserving life, & resisting death than

sound parts. — Hence, we can conceive the application of Arsenic to cancers will sometimes produce the destruction of the whole of the parts labouring under cancer, without depriving the surrounding parts of life.

MCCVI. Chemical applications as the different caustics () have also been employed, but the powers of Arsenic are the greatest, the caustics making less distinction in their action between the sound & unsound parts, the latter acting chemically, Arsenic by its irritation exciting an action under which the diseased parts have not strength to resist.

MCCVII. If we employ the knife we should always cut into sound parts. In general we can employ excision more universally than other means.

MCCVIII. We should, for the cure of the ulcer after the operation, any lump arises or any consequent cancer appears, it is right to remove them as soon as discovered.

MCCIX. If a cancerous disposition remains after the operation, the wound either will not heal or the cicatrix will soon ulcerate afresh, or the consequent disease will make its appearance.

MCCIX. It is necessary to take notice of some cancerous

340 affections of particular parts. -

Of the Breast. -

MCCX. Cancer of the Breast mostly begins with a small scarrhopous lump, which is ingeneral circumscribed, at other times it begins with a discharge of blood, or a kind of matter from the nipple: sometimes the skin becomes diseased very early, being thickened, discoloured &c. -

MCCXI. The natural functions of the breast is destroyed, it loses the power of secreting milk, is painfully

MCCXII. It should be amputated before there is any adhesion of the breast to the pectoral muscle or ribs; and before the glands in the Axilla become affected, or at least before these circumstances take place in any great degree.

MCCXIII. We must be cautious in examining the axillary glands, for sometimes when enlarged they may seem moveable, but when we come to operate we may find a chain of little diseased glands extending beyond the reach of the knife, and render our endeavours fruitless.

MCCXIV. If the cancer of the Breast is suffered to become irremediable the ulceration increases with stiffness & tightness of the surrounding parts, the breathing

becomes affected & is difficult & laborious.

MCCXVI. The axillary glands being universally and greatly enlarged, the return of the lymph from the arm is obstructed, - hence an edema of the whole arm, sometimes soft, sometimes hard, takes place.

MCCXVII. In some patients the integuments on that side of the body will become adenomatous, and even a paralytic affection of that side of the body on which the disease is situated may ensue.

MCCXVIII. Consequent cancers will be formed & at length the patient worn out for want of sleep, until at length she sinks & an end is put to her sufferings.

MCCXIX. In this as in all other cancerous affections, the liberal, and unlimited use of Opium is to be permitted.

MCCXX. If cancer is seated in the Testicle it should be removed before the spermatic chord is thickened, or at least whilst so much of it is apparently undiseased without the abdominal ring, as to have room for the performance of Castration. Then we are justified in operating, tho' the success is uncertain.

MCCXXI. In the cancer of the Testis the pain is more excruciating than in the breast: with regard

342. to the extirpation & the administration of Opium the rules given will apply.

MCCXXII. In the cancer of the Testis the consequent cancer will be in the spermatic chord, the abscess of the Testicle pursuing its course.

MCCXXIII. If the scrotum is the seat of cancer, the consequent disease will be in the inguinal glands.

MCCXXIV. In the lip the disease begins with a thickening. It is to be removed by the operation of the hare-lip, in other respects the preceding general rules must be observed.

MCCXXV. It is not necessary to dwell on the particular cancers of other parts, as the eye, the nose, the uterus &c. Extirpation where practicable should be early employed; where impracticable, means of alleviating pain only be had recourse to.

MCCXXVI. The itch is a specific disease produced by a morbid poison, which being applied to the skin produces ulceration in it.

MCCXXVII. The itch is contagious, the person infected being always able to communicate it to others in the same manner as he received it.

MCCXXVIII. Contact of parts is necessary to its being communicated: in a state of vapour it has

343. no power of contagion, & its power of infecting is very weak & easily guarded against.

MCCXXIX. Animalcula may exist in the matter but not necessarily universally.

MCCXXX. Continued sympathy produced by it is very little & contagious sympathy hardly ever takes place from its action. it has no power of poisoning the system, nor have the absorbents ever been seen to be affected by it.

MCCXXXI. Its most ordinary seat is where the cuticle is thin: its first appearance is a small vesicle containing a little fluid, to this succeeds an ulcer discharging pus, which in the recent state is very minute, but when of some standing considerably increases in breadth so as to be sometimes as large as a sixpence.

MCCXXXII. The little ulcers made by the itch never heal spontaneously & when healed by art they do not again break out, nor do other ulcerations arise in the surrounding skin.

MCCXXXIII. Its power of irritating is not very considerable the surface of the body must be healed to be sensible of its irritation, the sensation it occasions is itching, not pain.

344. MCCXXXIV. Different remedies are found to be
specific for the itch: sulphur, Hellebore, Mercury,
externally used are known to cure it; but sulphur
ointment seems to be the most powerful remedy.

MCCXXXV. A mercurial girdle has been known
to cure the disease, even when mercurial ointment
applied to the skin has failed. Brimstone taken
internally will sometimes cure the Itch.

Finis.

Sept 2^d 1792. -

Transcribed.
Nov 18th 1815 }

Local actions induced by morbid poisons resolve themselves into the following divisions:

Increased & altered secretion on secreting surfaces without loss of substance.

~~surfaces, with loss of substance~~ on non-secreting surfaces - viz.

1. Slough, with consequent fungus & scab, as in yaws.
2. — with suppuration & scab, as in small-pox,
3. — preceded by ulcer, and when separated followed by immediate skinning, as in several anomalous poisons
4. — with ulceration, and each in succession, as in the sloughing Phagedena.
5. Ulceration, kept up by the irritation of the secreted pus, as in Syriens and some anomalous Phagedena.
6. — with a thickened edge and base, as in the venereal. —

Haller was of all European physicians, the most determined to excel, the most learned, the most industrious, the most accomplished in every respect, and consequently the most worthy to be imitated & studied. —

Division of the Body into Three Parts

1. Sensitive
2. Insensible, and
3. Irritable. —

1st of Irritable Parts

The Heart — retains its motions even when separated from the body.

After this Spontaneous motion ^{has ceased} it may be renewed by stimuli.

The punctum Salinis, which is the heart of a chick beats, before we dare presume that there is any organ to distribute the nervous power.

The heart must therefore be considered the Primum Mobile as it is the Ultimum moriens of the animal machine.

The heart possesses different degrees of Irritability in different classes of beings.

The doctrine refuted which supposes Irritability is derived from the nerves

1st For the most irritable parts are not ~~always~~ infrequently the least sensible

2. Because the Irritability of parts separates from the brain & nerves continue irritable for some time after.

3. Because the nerves & brain are in themselves irritable, as may be proved.

The Muscles.

These cannot be defined by their colour, but only by their contractile power which each muscle has in common with the rest.

It is from this Power that a muscle is able to move a weight, which tears it when dead.

Irritability proved to be independent of nerves and Brain.

Irritability survives the loss of nervous power The Diaphragm.

It retains for a long while its Irritability The anatomy of this muscle.

The Oesophagus or Gullet.

Proof of its Irritability.

Its Structure.

The Stomach.
Proof of the Irritability of this Organ.
Its anatomy.

The Intestines.
Proof of their Irritability.
their anatomy.

The Arteries.
Proof of their Irritability.
their anatomy.

The Lacteals.
Proof of their Irritability.
their anatomy.

2. Of Irritable parts.
Def. - That every part, under the influence of the ^{same} cause, which remains
in a state of quiescence, is an irritable part. -
The Lungs.

Its anatomy, with some slight observations re-
specting its Office.

The Liver.

The Kidney.

The Spleen.

Proof that these parts are irritable.
their anatomy.

The Gall. Liver, Common Ducts
Proof of their Irritability.

The Nerves
Proof that these are irritable
Their anatomy.

3. Of Sensible Parts.

The Brain

Proof its extreme sensibility.
Its anatomy.

The Spinal Marrow

Proof of its Sensibility
Its anatomy.

The Nerves.

Their Sensibility

The Skin

Its Sensibility.

Its Anatomy.

The internal Membranes of the Stomach
Intestines
Bladder
Uterus.

Their Structure.

Muscular Flesh.

This is proved to derive its Sensibility wholly
from the Nerves which pervade it.

The Breasts,
The reason of their Sensation
Their Anatomy.

4. Of Insensible Parts.

The Dura Mater.
Proof of its Insensibility.
Its anatomy.

The Pia Mater.
Proof of its Insensibility.
Its anatomy.

The Periostracum.
Proof of its Insensibility
Its anatomy.

The Peritonaeum.
Proof of its Insensibility.
Its anatomy.

The Pleura.
Proof of its Insensibility
Its anatomy.

The Pericardium.
Proof of its Insensibility
Its anatomy.

The ~~Parietal~~ Mediastinum
Its anatomy.

The Cellular Membrane.
Proof of its Insensibility.

The Fat
Proof of its Insensibility.

The Tendons
Proof of their Insensibility.
Their anatomy.

The Capsule.

The Ligaments.

The Bones.

Proofs of their Insensibility in a state of
health.
are they insensible in a state of disease?

The Marrow.

Proof of its Insensibility

The Teeth.

Proof of their Insensibility

Their anatomy.

Recapitulation

Three general facts concerning the
Physiology of the Human Body.

- 1st That every part which transmits from the point of ^{impression} ~~contact~~ the sensation of pain, describes a sensation to the mind proportional to the impression, and is, therefore, denominated a sensible part.
- 2^d That every part which transmits to the mind no sensation of pain, nor change in the situation of the body, is an insensible part.
3. That every part which contracts, is an irritable part, and is as the force which operates, and inversely as the life of the part.

Anatomy of the Ear.

from Saunders "On the Anatomy & Diseases of the Ear"

The Auricle is placed by the side of the head, & joined to the head by its root to the Os temporis: The margin of that side, which is turned from the head, is considerably elevated, and the general concavity within the margin is, by the use of the surface, subdivided into certain curvilinear grooves, all of which tend towards a canal, formed in the root of the Auricle, the Meatus Internus.

The Concha, the deepest & largest depression of the Auricle, is situated at the Entrance of the Meatus Internus. The boundaries of the Concha are formed by four eminences, viz. the Tragus, Helix, Antihelix, and Antitragus. The Tragus and Helix bound it before, the Antihelix and Antitragus behind.

The Tragus is placed immediately behind the Condyle of the lower jaw. It rises into a little knob, & lies on the forepart of the Meatus Externus.

The Helix arises from the Concha, which it partially divides into a superior & inferior depression. It advances from its origin a little before the Tragus, is soon reflected in the form of a curve, and in its descent gradually becoming less distinct, is lost in a soft pendulous substance, the Lobule.

The Antihelix lies within, and opposite to the Helix and is formed with a similar curve. Alone it consists of two ridges, which unite, and the eminence, formed by their union.

is continuous below with a little projection, called the *Antitragus*, from its possessing a situation directly opposite to the *Tragus*.

A considerable groove is formed between the *Helix* and *Antihelix*, which increases in depth, as it approaches the *Concha*, where it terminates. Another groove, formed between the two ridges of the *Antihelix*, joins the former just before its termination in the *Concha*.

These are the most remarkable appearances of this side of the *Auricle*. The opposite side possesses little that requires particular attention. It may be said to be convex but in ^{the} general convexity the projections of the *Concha*, *Helix*, and *Antihelix*, are readily distinguishable.

The *Auricle* is composed of an elastic cartilage, and the common integuments. Its figure is chiefly derived from the cartilage, in which the eminences and depressions, already mentioned, are fashioned, except the lower part of the *Helix* and the *Sole*. These are nothing more than duplicatures of skin, containing a portion of fat.

The root of the *Auricle* is distorted in the form of a tube, but it is to be observed, that the cartilage itself does not complete the circle. This is effected by the union of the *Tragus* to the *Helix*, by a ligamentous fascia, and the common integuments.

This tubular part of the *Auricle* is united to a tubular part of the *Os Temporis*, and they form by their union the *Meatus Externus*, a canal leading to the interior parts of the *Ear*. The length of this canal

varies in different subjects from an inch and a quarter to an inch and a half, and its area gradually diminishes as it approaches its termination. Its shape is rather elliptical than cylindrical, its direction inwards, with a slight declination. It is not rectilineal but winding. It is turned upwards, then downwards, and is slightly bent near its termination. Its lower part is longer than the upper, but it terminates, as it were, by an oblique section, which is closed by the Membrana Tympani, in such a manner, that the Membrana Tympani makes an obtuse angle with the canal above, an acute angle below.

The common integuments, having covered the cartilage of the Auricle, enter the Meatus Externus, and having reached the bony portion of this canal, become extremely thin. They form a lining for the Meatus, and terminate in a pouch, that is placed in contact with the Exterior surface of the Membrana Tympani.

The Skin of the Auricle, and that of the Meatus Externus, are both perforated with numerous small holes, the orifices of sebaceous follicles in the former, in the latter of the ceruminous ducts.

The ceruminous ducts, glands themselves are placed exteriorly to the Cutis of the Meatus Externus, in the interior of a reticular membrane. They are about the size of Millet seed, approach to a spherical or elliptical form, and are tinged of a slight yellow by the cerumen

which they contain. Each little gland sends a small duct, that opens in the Meatus Externus, and discharges the Cerumen, which is there found, and answers the purpose of keeping the Membrana Tympani moist.

The auricle is retained in its situation by the ligamentous connexion of the cartilage with the bone of the Meatus Externus, and by a strong ligament that passes from an acute point of the Helix to the zygomatic process of the os temporis.

The description just given, is taken from the Adult Ear. In the Fetal Ear, the parts of which are less completely formed, the Meatus Externus is almost entirely cartilaginous, & membranous. Instead of a process of the Os temporis, forming a considerable part of the Meatus Externus, nothing more is discovered in the Fetus than a slender piece of bone of an elliptical figure, but not making a complete ring. It contains the Membrana Tympani and adheres to the rest of the Os temporis only by its extremities. The space between the Tragus and this ring of bone, is occupied by a very dense membrane that seems placed thus as a kind of bed, in which bone afterwards deposited. As ossification extends, the different parts of the Os temporis are consolidated. Indeed soon after birth the Fetal ring is united to the rest of the bone, and is gradually elongated during the progress of growth until it occupies the place of the membranous substance just mentioned. —

It has already been said, that the Meatus Externus terminates obliquely and that its lower part is longer than the upper. A little groove, making three fourths of an Ellipse, is formed in its extremity. It contains the Membrana Tympani.

The Membrana Tympani is the partition between the external and the middle part of the Ear, and is so called from its closing the orifice of a cavity named the Tympanum.

A description of the Middle part of the Ear, viz of the Tympanum, of the Machinery contained in the Tympanum, and of certain parts annexed to each.

The Tympanum is the Cavity that lies immediately at the bottom of the Meatus Externus. It is formed between the squamous & petrous portions of the Os temporis. Its figure, although irregular, approximates to the spherical.

The regularity of the bony superficies, in which the Tympanum is placed, is interrupted by numerous little pits, spicula, and foramina. The depth of the Tympanum is not equal in all directions, its greatest depth is opposite to the aperture of the Vestibule, the least to the Apex of the Cochlea. The former scarcely exceeds three lines, the latter is hardly two. The length and breadth of the Tympanum are nearly equal, each measuring about the third of an inch.

The Mastoid cells are placed behind the Tympanum

They are large and numerous, freely communicate with each other, and open by a large aperture in its posterior and superior part. They may be considered as a part of the Tympanum, for the communication is perfectly free, and they are both lined with a delicate and vascular membrane, that secretes a fluid to moisten the internal surface, at the same time that it answers the purpose of a periosteum to the bony superficies.

In the anterior and lower part of the Tympanum is placed the aperture of the Eustachian Tube. The Eustachian Tube proceeds from the Tympanum, passing obliquely forwards and inwards by the side of the internal ala of the pterygoid process of the OS sphenoides, and opens in the superior and lateral part of the Pharynx above the Velum Palati Molle. These Eustachian Tubes reach their termination in the Pharynx with so great a degree of convergency, that if they were produced they would meet each other at the back of the Vomer.

The Eustachian tube is composed of bone and cartilage. The bony portion is lined with the same membrane as the Tympanum; the cartilaginous, with a reflection of the membrane of the Pharynx, which is blended so intimately with the former, that no line of distinction is perceptible.

The bony portion is an elongation of the Tympanum and ends in a scabrous extremity that receives the cartilage. The cartilaginous portion, as it is called, is not entirely composed of cartilage. It consists on the fore part of a dense membranous substance, which, together with the cartilage, affords a surface for

the origin of two muscles, the *Sciator Palati Molli*
and *Circumflexus Palati*.

The two portions united, constitute a tube about an
inch and a half, or an inch and three quarters in
length, of an elliptical figure, the major axis of
which is vertical. The magnitude of this tube varies
much in different places. Its orifice, in the *Symphonium*
is about two lines in its major axis. Hence it gradually
expands, until it does not exceed one. This magnitude it
preserves for a short space, but at the junction of the
long portion to the cartilaginous, it suddenly enlarges,
and continues to increase until it terminates in the
Pharynx, where it opens by an orifice, large enough to
admit a goose quill.

Besides the apertures already mentioned, viz, the
aperture of the *Mastoid* cells, and that of the *Eustachian*
tube, two others present themselves in the interior superficies
of the *Symphonium*. These are the aperture of the *Vestibule*
and the aperture of the *Cochlea*; the former called the
Fenestra ovata, the other the *Fenestra rotunda*.

The *Fenestra ovata*, is placed in the upper part of the
internal superficies of the *Symphonium*, in an oblique
direction, but parallel with the plane of the *Membrana*
Symphani. It is not perfectly elliptical. Its upper part is the
segment of an ellipse, the lower a straight line connecting
the extremities of the segment. It exactly resembles the base
of the *stapes*, a bone, here to be described, which shuts it
up, and therefore in the acute state, this aperture is not
to be discovered unless the *stapes* be displaced.

The *Fenestra rotunda* is lower than the *Fenestra ovata*, and nearer the *Mastoid* process. This aperture is also shut in the recent state by a membrane of an oval figure, similar to the *Membrana Tympani*, and like that, ^{also} ~~also~~ internally. It is placed ^{some} way within the *Fenestra rotunda*, and is not discoverable without dissection, even in the *Fetal* Ear, in which the bone is less evolved.

The *Tympanum* is separated from the *Meatus Externus* by the intervention of the *Membrana Tympani*.

The *membrana Tympani* is pellucid and of an elliptical figure. Its major axis is placed, neither vertically nor horizontally, but obliquely. It is fixed in the ⁱⁿ the elliptical groove at the termination of the *Meatus Externus*, except in the posterior and superior part, where the groove is deficient. There it is attached to a rough surface of the bone.

From what has already been said of the oblique termination of the *Meatus Externus*, it must be evident that the *Membrana Tympani* is very much inclined, and that its superior and posterior part is not so far distant from the orifice of the *Meatus* as the inferior and anterior. It is a thin pellucid membrane, strengthened without by the cuticle of the *Meatus Externus*, and within by the lining of the *Tympanum*. Although always in a certain state of tension, yet it is not a plane; on the contrary, it is very convex towards the *Tympanum* and the convexity is of a conical figure, the apex of which is in the centre. To this ~~membrane~~ ^{membrane} the manubrium of the malleus is attached.

The *Membrana Tympani* is exceedingly vascular,

Numerous little vessels descend along the Manubrium of the malleus, from which diverging twigs proceed. These form beautiful and intricate insculcations with a plexus of vessels ridged in the margin of the membrane.

The Tympanum contains four little bones, articulated with each other, and forming a chain of communication between the Membrana Tympani, and the Membrane of the internal part of the Ear, in which the sense of Hearing is seated. They are the Malleus, Incus, Os orbiculare, and Stapes.

The first of these is the Malleus, which may be divided for the purpose of description into three portions, namely, the Manubrium, the Head, and Processus Gracilis.

The Manubrium adheres to the Membrana Tympani. It is incurvated, particularly at its extremity, which reaches the centre of the Membrana Tympani, and draws it into its convex state.

The head is joined to the Manubrium by a slender portion of the bone, which some have called the neck. It makes a considerable angle with the Manubrium, and its direction is obliquely upwards and backwards. It is of a globular form, but on one side the surface is irregular to fit it for a firm articulation with the Incus.

The Processus Gracilis, passes off just between the head and Manubrium, with which it makes almost a right angle. It is articulated in a particular groove of the Os temporis, and is fixed by a ligamentous substance, which has been described by anatomists as a muscle. It turns in this groove, and is in a word,

a pivot, on which the motions of the Malleus are performed.

The second bone is the Incus. It may be divided into body and two crura.

The two crura are of unequal lengths: the shorter one is thicker than the other, and is placed almost horizontally. It articulates in a little depression near the aperture of the Mastoid cells. The ligaments, which retain it in this articulation, allow a considerable degree of motion.

The longer crus descends from the body of the bone, is more slender than the other, and bent at its extremity towards the Stapes, with which it articulates by the intervention of the Os orbiculare. Its direction in the Tympanum is parallel with the Manubrium of the Malleus, and consequently with the Membrana Tympani.

The third bone, the Os orbiculare, is very small, hardly as big as a millet seed. Although named the Os orbiculare, its figure is oval. It may be considered as an inter-articular bone, between the Incus and Stapes, connected with both, but more firmly with the former, to which it generally adheres, when the bones are separated.

The fourth bone is the Stapes. It consists of a base and two Crura, that coalesce to form the head, which is of an oval figure. To this the Os orbiculare is attached.

The two Crura are bent, and that which is nearest to the Mastoid process is more incurvated than the other. They are grooved on the inside, and a Membrane occupying the area of the Staples is fixed in the grooves.

The base of the Staples exactly fits the Fenestra Ovalis, which it closes. It is kept in this opening by the membranous lining of the Tympanum, and the membrane of the Vestibule, but enjoys a certain degree of motion. The Staples passes from the extremity of the Incus to the Fenestra Ovalis in an oblique direction, so that the base is a little higher than its head, and the sides are between the vertical & horizontal line.

These bones are articulated with each other by capsular ligaments, of a degree of tenacity proportioned to their Minuteness. They are covered with a fine vascular membrane, from which numerous little vessels proceed, that penetrate their substance. They are the nutritious vessels of the bones, and the membrane may be considered as their periosteum.

The mechanism of these bones is regulated by the action of two muscles, the Tensor Membranae Tympani and the Musculus Stapedius.

The Tensor Membrana Tympani, is contained in a small bony canal, parallel with the Eustachian Tube, from the cartilage of which its fibres are derived. These fibres are collected into a long round muscle, that passes through this canal and enters the Tympanum by a slender round tendon. The

tendon issuing through a small aperture, at an obtuse angle to the line of the muscle, is partly deflected towards the manubrium of the Malleus and is inserted into its upper part.

The action of this muscle retracts the Tendon into the aperture of the bony canal. By this the manubrium of the Malleus is drawn inwards, and the membrana tympani, which is attached to it, put upon the stretch.

A similar effect is produced on the membrane of the vestibule by the contraction of the Musculus Stapedius, the fleshy belly of which is contained in a canal of bone contiguous to the stylo-mastoid canal. It sends a small round tendon through an aperture of the bone, which is directed obliquely upwards to the head of the Stapes into which it is inserted.

What remains to be described of the middle part of the Ear is the little nerve of the Tympanum, well known by the name of the Chorda Tympani. As the portio dura of the auditory nerve passes through the stylo-mastoid canal between the Tympanum and Mastoid process, it detaches a small branch through a particular canal, which opens in the back of the Tympanum, near the groove, that contains the Membrana Tympani.

The chorda Tympani traverses the Tympanum, lying

between the Manubrium of the Malleus and long-
Crus of the Incus, and enters another little canal
nearly opposite to the former. It then continues its course
forwards and downwards between the Pterygoid Muscles,
and joins the Singular branch of the Inferior
Maxillary nerve. This extremity of the Chorda Tympani
is larger than that which is joined to the Portio dura,
whence some have considered it as a branch of the
Singular nerve. It is, in a word, a nerve of Commu-
nication, equally belongs to both, and is connected with
the trunk of each at an acute angle.

A Description of the Internal part of the Ear, which
contains the Expansion of the Auditory nerve, and may
therefore be considered the Seat of Hearing.

The Internal part of the Ear, which I am now
about to describe, has on account of the Intricacy of the
canals and cavities which compose it, been generally
denominated the Labyrinth. It comprehends the Vestibule,
semi-circular Canals, and the Cochlea, which are situated
in the Petrous portion of the Os Temporis.

The vestibule is the Central cavity, and communicates
both with the semi-circular canals and the Cochlea;
the latter lying in the extreme point of the petrous portion

the Otterporis, the former towards the Mastoid Cell. The shape of the Vestibule is irregularly spherical. However, on examination, when it is properly laid open, two distinct depressions are observable, one semi-elliptical and situated above, the other hemispherical and situated below. Both are opposite to the Meatus Internus, a canal soon to be described, and the bony partition, is thin and perforated with numerous small holes to transmit fibres of the Auditory nerve.

In the prepared bone, the Vestibule is open towards the Tympanum, but as we have already seen, the Fenestra Orata is, in the recent state, closed by the base of the Stapes. Six other apertures present themselves in the Vestibule, five of which belong to the semicircular canals, and the sixth is the beginning of one of the Scala of the cochlea.

The semicircular canals although universally so called, are all larger than semicircles. They make at least three-fourths of a circle. Their calibre is small, about the size of a common pin, and of an elliptical figure. The smallest part of each canal is about the middle of its curve. They enlarge as they enter the Vestibule, but one extremity of each canal is particularly dilated, and is called Ampulla.

The semicircular canals are three, and are distinguished from each other by names given

them from their position or direction. I shall call them the Vertical, the oblique, and the Horizontal.

The Vertical canal describes its curve in the summit of the Petrous portion of the Os temporis, and crosses it with its convex side above.

The oblique, on the contrary, describes its curve in the occipital side of the Os temporis, and its convexity is placed below.

The Horizontal canal is bent with its convexity towards the mastoid process, and is directly above a portion of the stylomastoid canal.

The three semicircular canals enter the Vestibule only by five apertures, for the smaller extremity of the Vertical canal joins the smaller extremity of the oblique, and their orifice is common.

The cochlea has received its name from its resemblance to the shell of a common snail. The resemblance is nearly external and is only discernible in the Cochlea of the Fetus during the first months, for as ossification advances, the Bony substance of the cochlea is blended with the rest of the Petrous portion of the Os temporis. However, the proper substance of the cochlea may be discovered even in the adult, by its greater brittleness & yellow colour.

The Cochlea is constructed with a Modiolus or central pillar, on which a spiral tube is wound, and a spiral lamina wound on the same Modiolus, lying within the spiral tube and dividing it into three. Its figure is conical & positive oblique. It is placed in the anterior part of the Petrous portion of the os temporis, contiguous to the canal that lodges the internal Carotid artery, with its base towards the Meatus Internus and the apex, which is lower than the base, towards the Tympanum.

To facilitate the description of the Cochlea, it will be advisable separately to consider the three parts which form it, that is to say, the Modiolus, the spiral tube & spiral lamina.

The Modiolus commences from the bottom of the Meatus Internus by a concave plate perforated with numerous Foraminula, the extremities of small bony tubes that freely communicate with one another, and run from the base towards the apex.

The Modiolus itself consists of these little bony tubes, blended into a mass of a conical figure. The interior fasciculi of tubes are the shortest and they lengthen towards the centre, in which the longest and largest, which reaches the apex of the Cochlea, is placed. They terminate on the

sides of the Modiolus at different distances. at their terminations they bend at right angles towards the spiral tube and their orifices describe about the Modiolus, a spiral tract, corresponding with the tube in direction. In proportion as they terminate the Modiolus diminishes, and its apex is exceedingly slender.

The spiral tube is wound on the Modiolus, and adheres to its sides. As it runs towards the apex, the curve which it makes is constantly diminishing. It makes two turns and a half from the base to the apex, and gradually decreases in its capacity. The spiral lamina arises from the vestibule and winds round the Modiolus within the spiral tube. Its greatest breadth is at its origin, whence it gradually becomes narrower, as it approaches the apex of the cochlea. Two thin plates of bone compose it, and appear to unite at their margin, from which a membranous substance which is reflected on each side, proceeds.

The spiral lamina with the aid of this membrane, makes a complete septum, and divides the spiral tube into two canals.

one of which is called the Scala Tympani, from its having an aspect towards the Tympanum, the other the Scala Vestibuli from its arising in the Vestibule.

The Scala Tympani is nearest the base of the Cochlea, and begins from the Fenestra Rotunda, but is prevented from communicating with the Tympanum by the Membrane which closes this aperture.

The Scala Vestibuli begins by an oval orifice between the Fenestra Ovalis & the Ampulla of the Vertical canal.

The two Scala run parallel with each other, but have no communication except at the apex of the Cochlea.

When the Cochlea is cut obliquely from the base to the apex at a proper distance from the Modiolus the section exhibits the appearance of three successive compartments, each containing a portion of the Septum of the Scala. The basif turn of the Septum occupies the last compartment, and as it joins the extremity of the spiral Tube, a little hole is left. This is the hole by which the Scala communicate.

To obtain a view of this aperture of communication it is necessary to preserve the membranous part of the Septum, for the Spiral Lamina itself does not reach the extremity of the Spiral Tube. This may be ascertained by examination of the macerated Cochlea, in which,

when a similar section is made, the extreme point of the spiral lamina may be perceived just rising into the last compartment & perfectly detached. but in the recent state, the membrane, which goes off from the spiral lamina to complete the septum, passes also from its point to the extremity of the spiral tube, where it is so attached, as to leave the little hole already mentioned.

In the occipital side of the Ostracopis, contiguous to the vestibule and cochlea is the canal through which the Auditory nerve passes. It is named Meatus Internus, is oval, and about the third of an inch in length. The extremity towards the labyrinth is closed except at the upper part, where a small foramen, which is the beginning of the Stylo-mastoid canal, appears.

Immediately below this foramen two cribriform plates are placed, the upper opposite to a portion of the semi-elliptical cavity of the vestibule, the lower to the hemispherical.

A little lower, and separated by a slight ridge, a cribriform sulcus is continued to a round concave cribriform plate, the base of the Modiolus of the Cochlea.

The vestibule, semicircular Canals, and the Cochlea, are lined with a delicate peristomium.

They contain also, a membranous texture, formed into sacs and tubes, and filled with a transparent fluid, similar to the aqueous humor of the Eye.

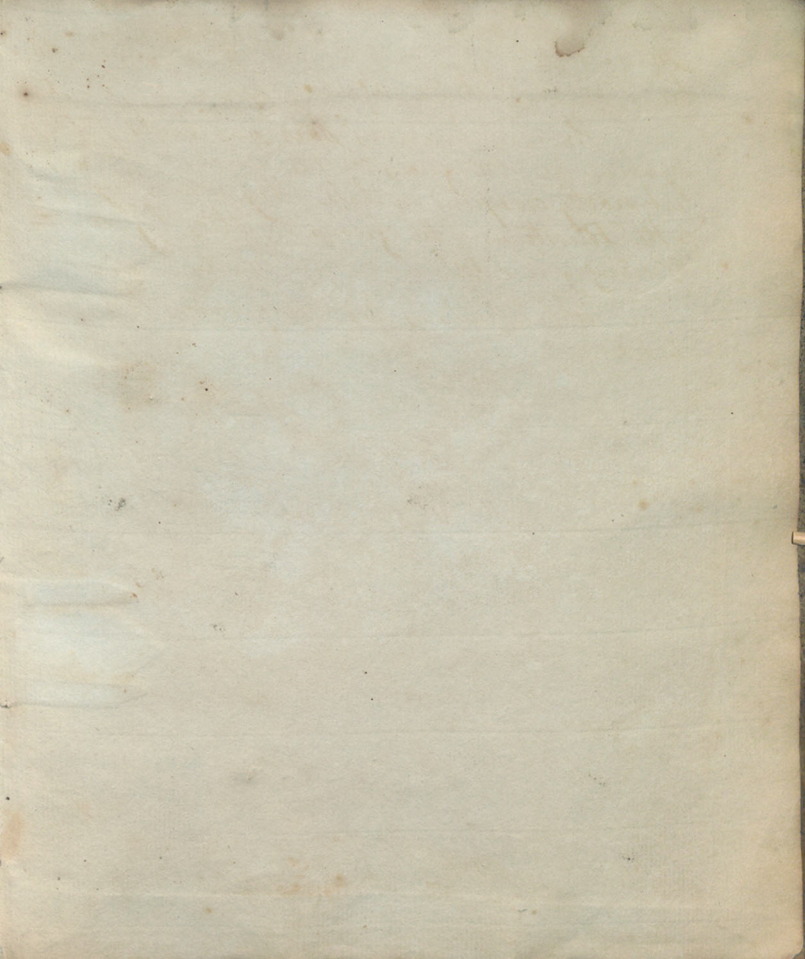
The membranous sacs and tubes are smaller than the osseous cavities which contain them, but exactly correspond in shape. They adhere very slightly to the Periosteum of the osseous cavities by an exceedingly fine cellular membrane.

The Vestibule contains two membranous sacs, one seated

[P. 37]

The same dense and impervious veil equally defeats our penetration into the abstract nature of life. We must be content to observe its existence without the hope of detecting its source; we may ascertain in a general manner, the circumstances by which it is continued, and terminated: but on the present state of our knowledge, we are not competent to determine that life is the superaddition of some particular principle to matter because the principle is unknown: neither are we entitled to affirm that it is the inevitable result of organization, as we cannot point out the necessary connections between structure and sensation. If however we are enabled, by penetrating into the abstract nature of life and into the constitution of the individual organisms: we perhaps by observation & knowledge of the organs, and agents by which the instances of mind are produced, and these are amply sufficient to illustrate the intellectual composition of our species.

Edinburgh's Lectures. Lecture 2, 1820. November 27



1840. Diseases of Bones.

Publications and Articles on the Formation & Pathology of Tubercles.

1. John Beres M.D. On Tuberculated Abscesses & Suppurative Membranes. London. 1849.

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